

FROM THE BIG BANG TO THE NOBEL PRIZE AND ON
TO THE JAMES WEBB SPACE TELESCOPE AND
THE DISCOVERY OF ALIEN LIFE

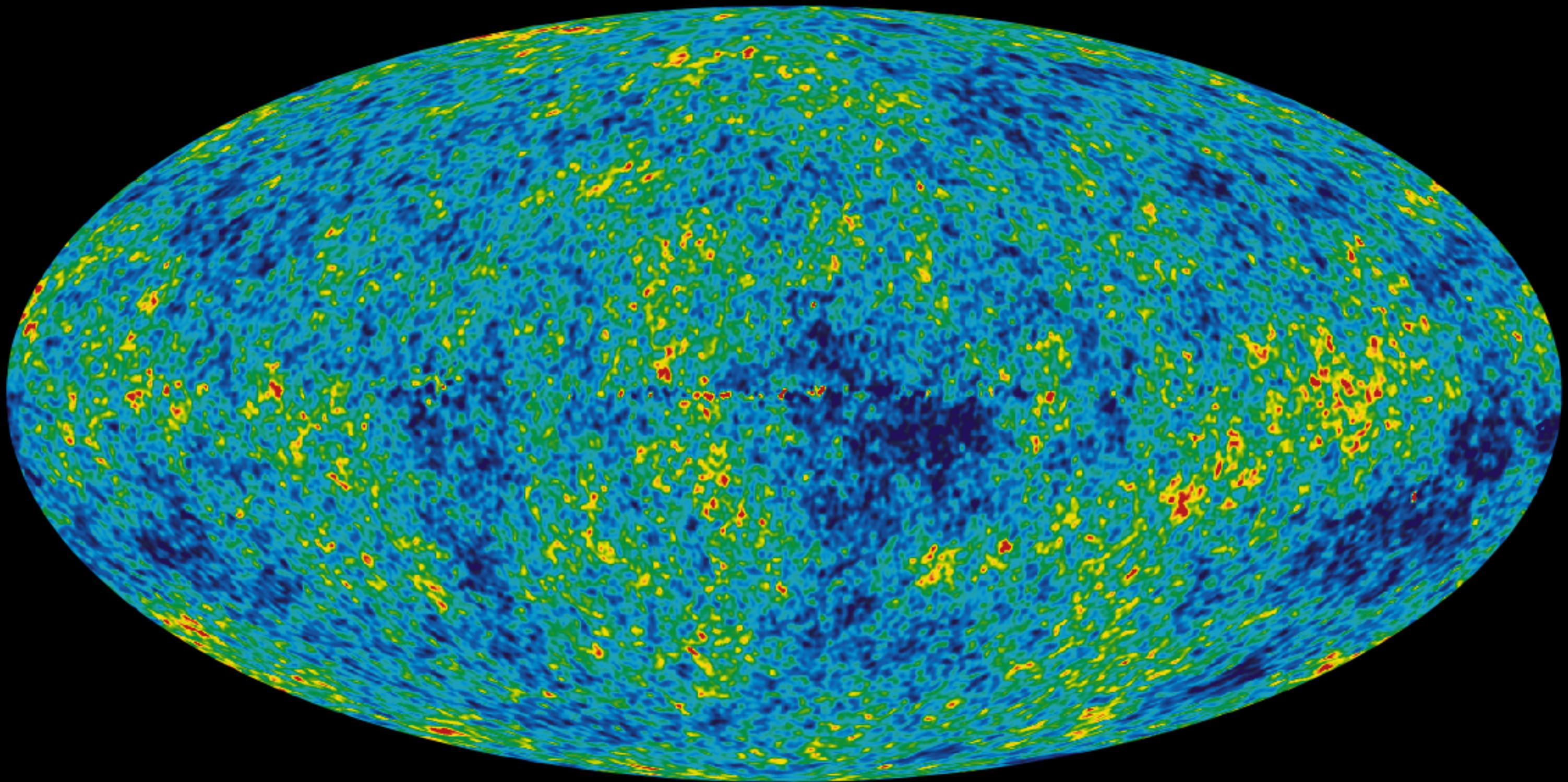
DR. JOHN C. MATHER

SENIOR PROJECT SCIENTIST
JAMES WEBB SPACE TELESCOPE
NASA GODDARD SPACE FLIGHT CENTER



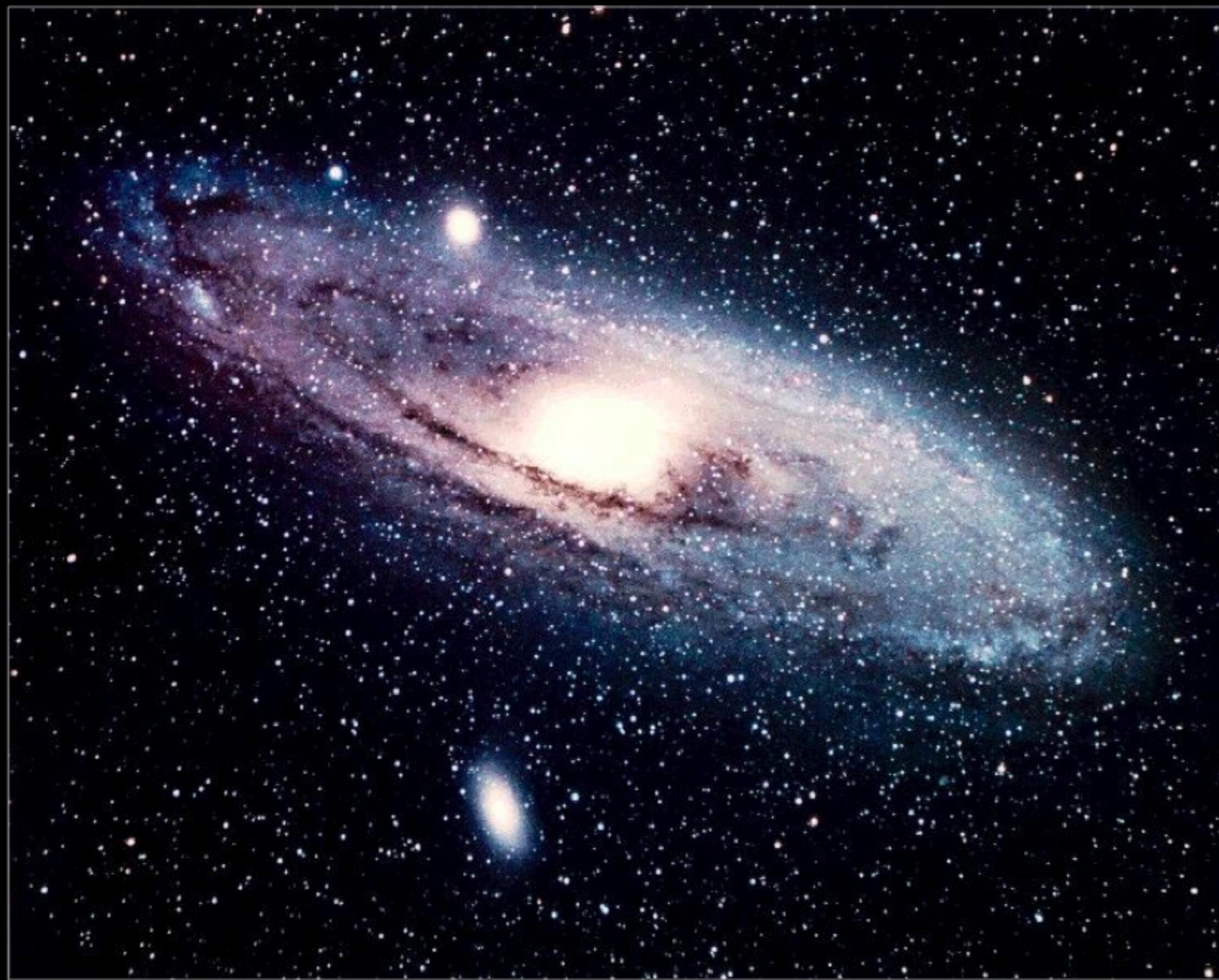
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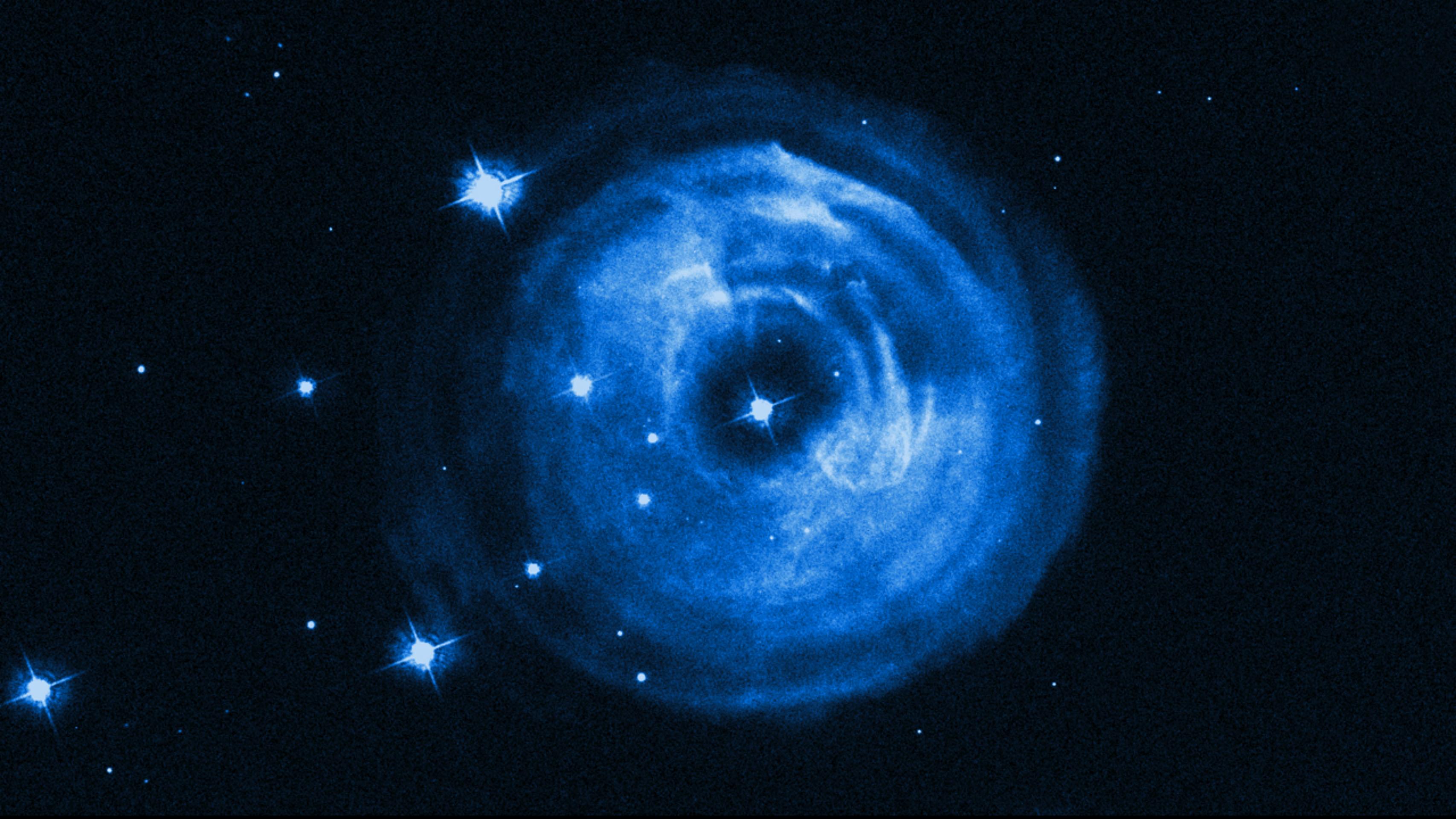


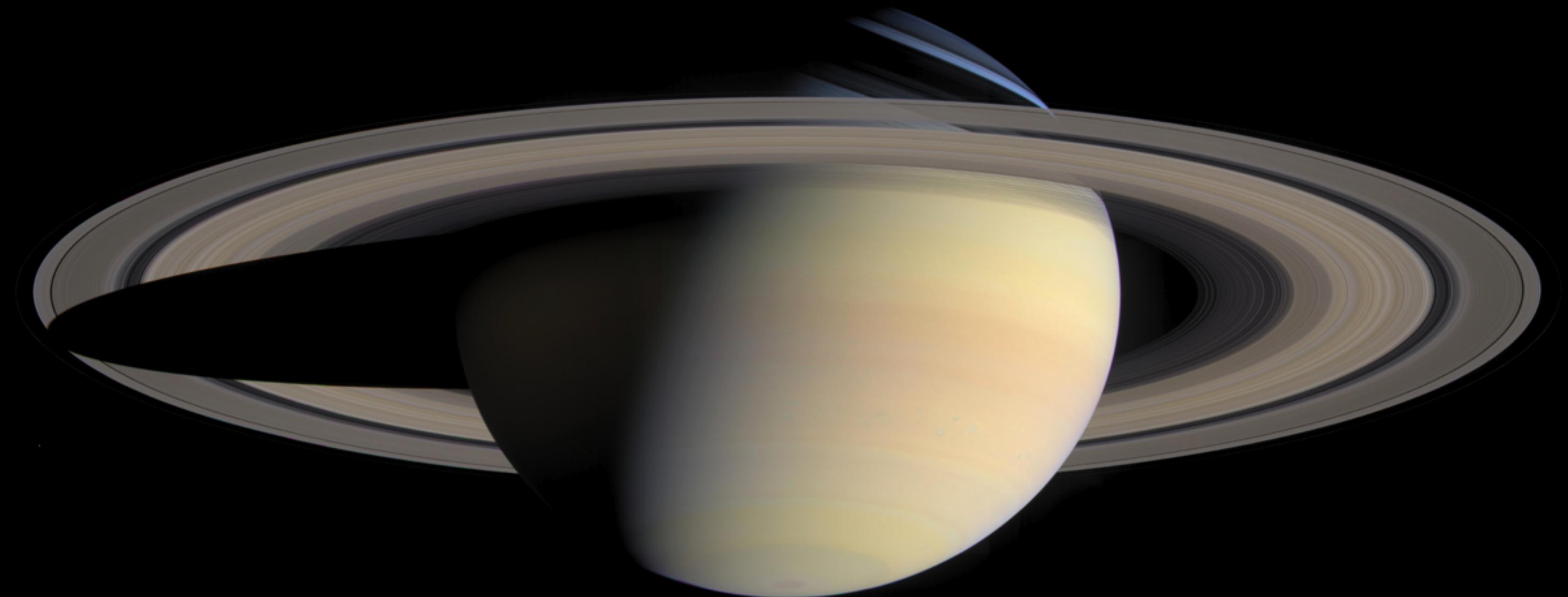


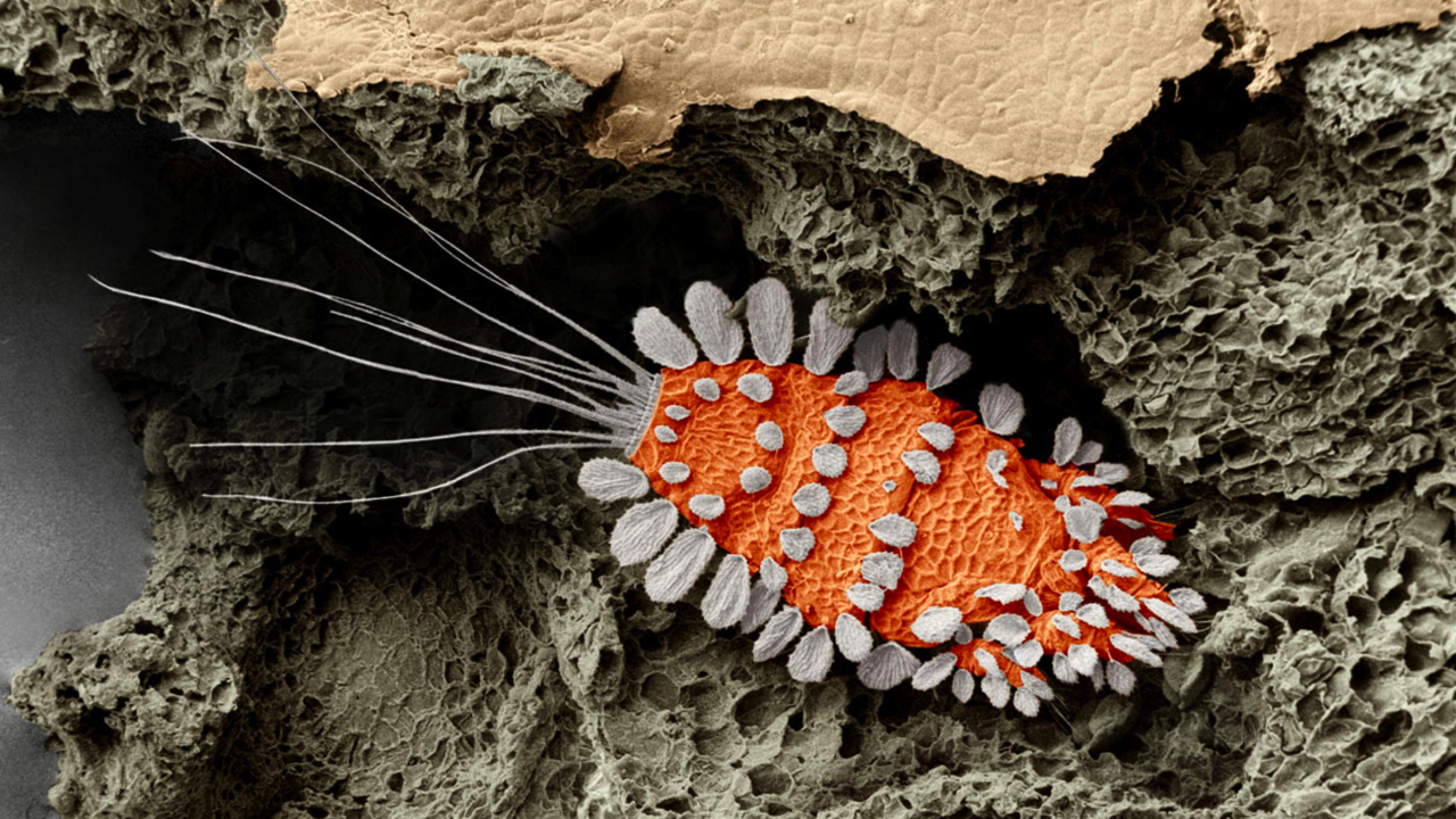


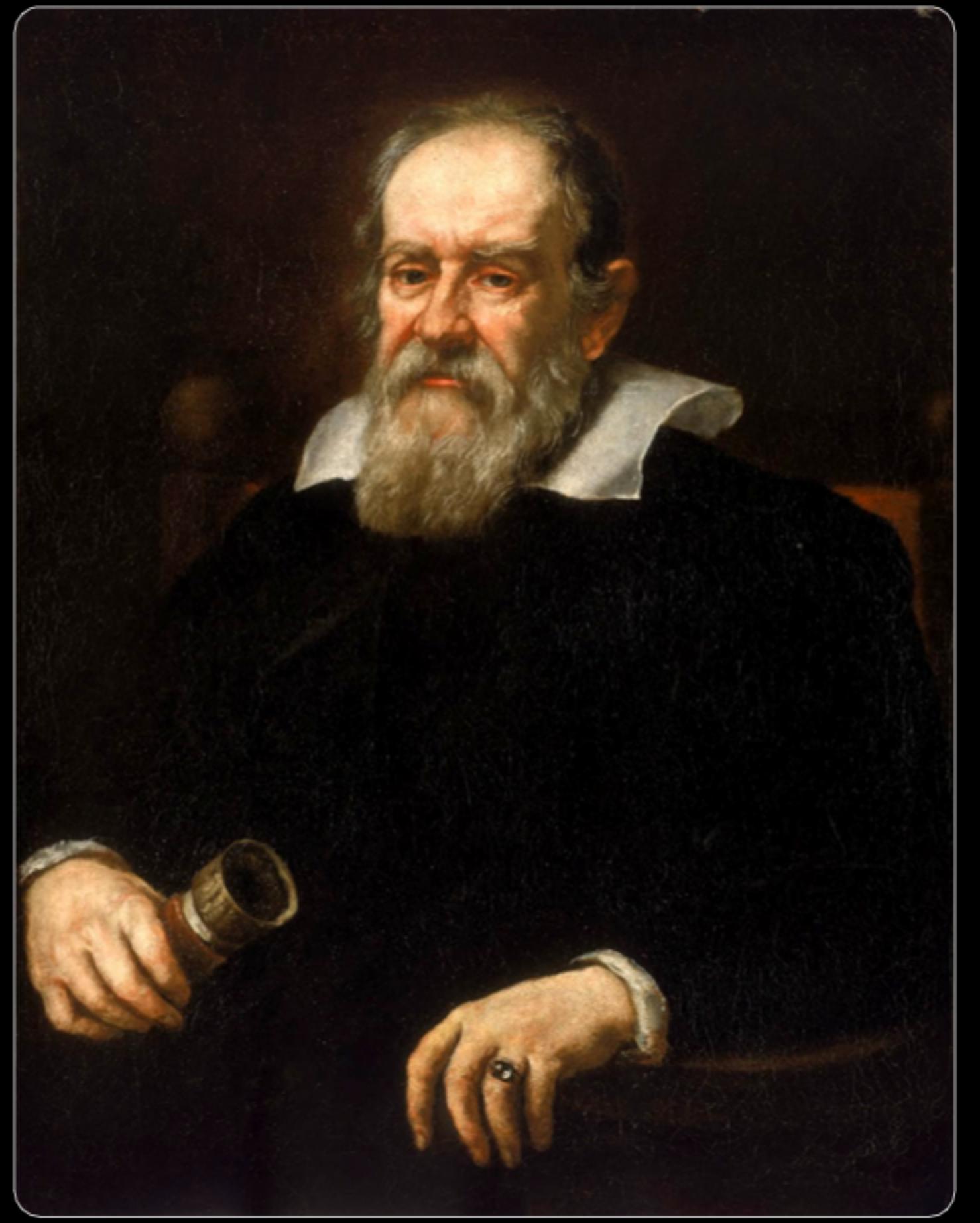














Your chin is made of
exploded stars!

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HAND



1 m

0.000000003

EARTH



7000 km

0.02 SEC

SUN



150,000,000 km

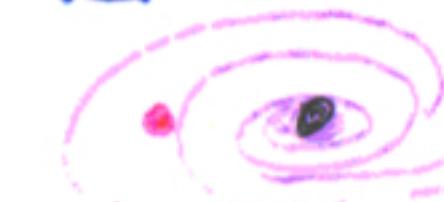
500 SEC

STAR



4 YRS

GALAXY



25,000 YRS

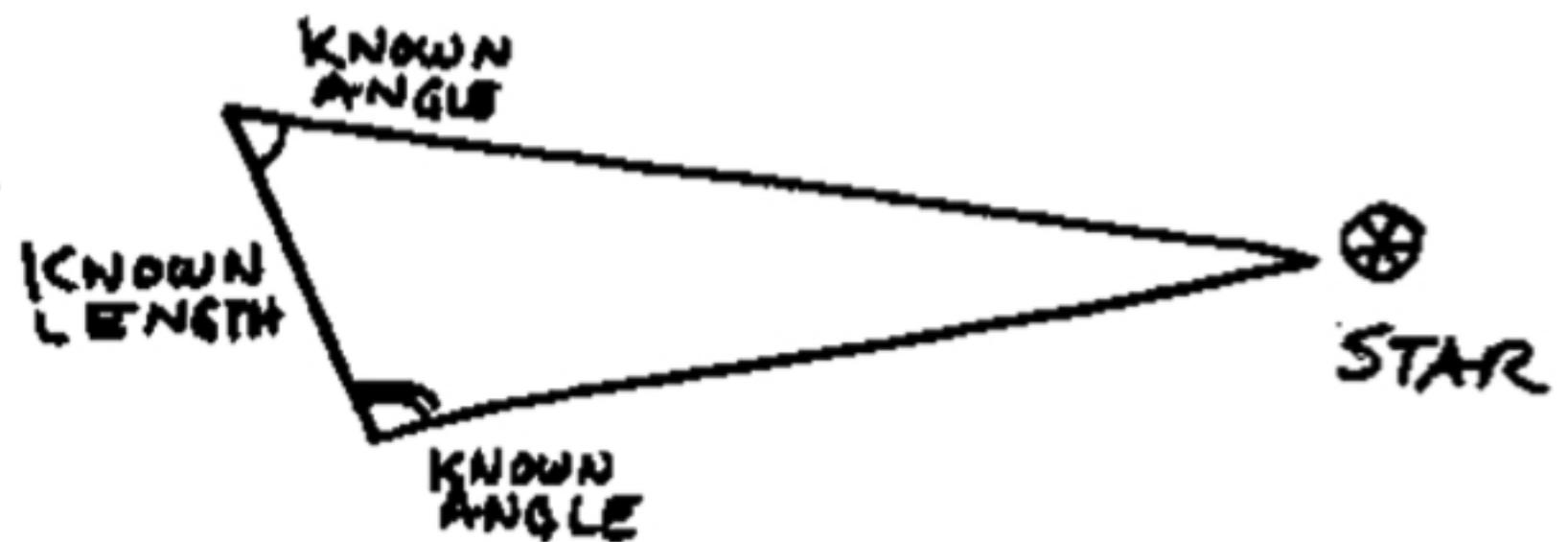
BIG BANG



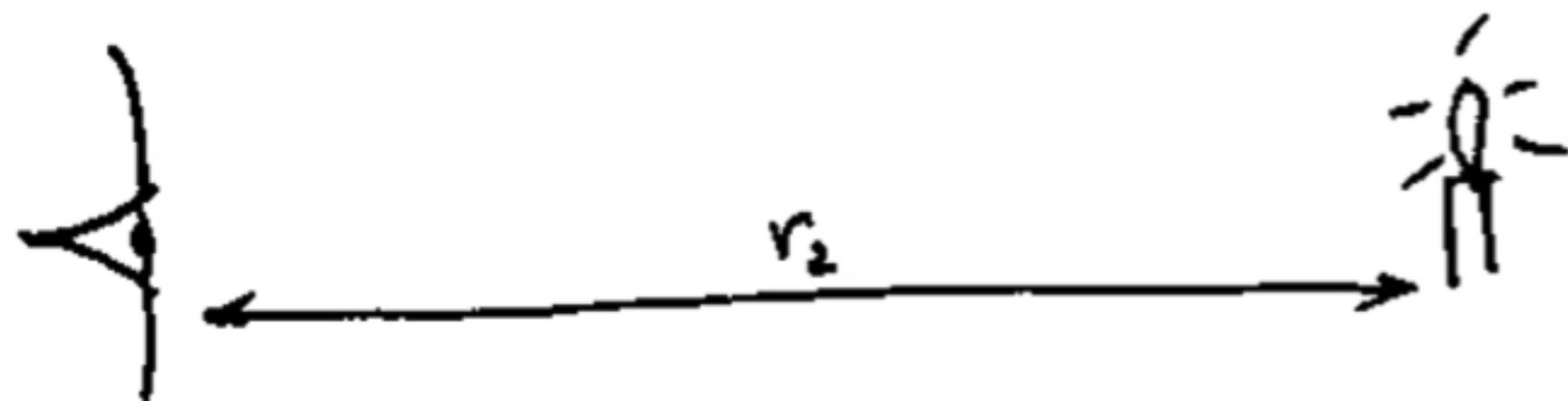
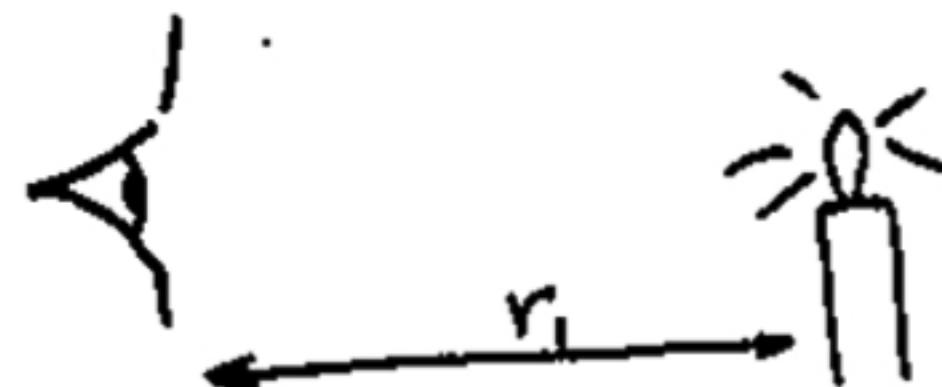
15,000,000,000 YI

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1. TRIANGLES



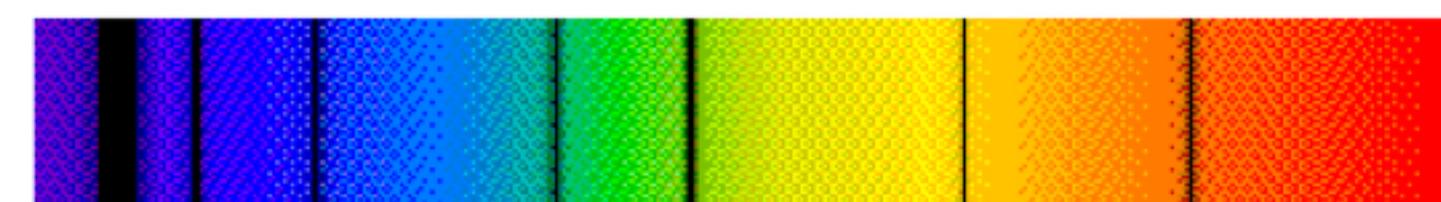
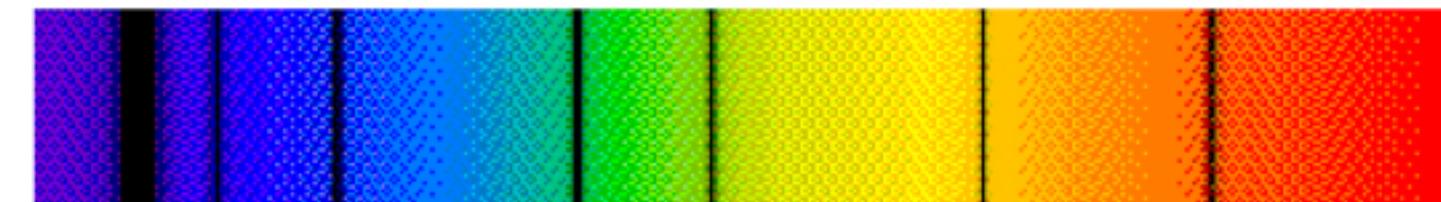
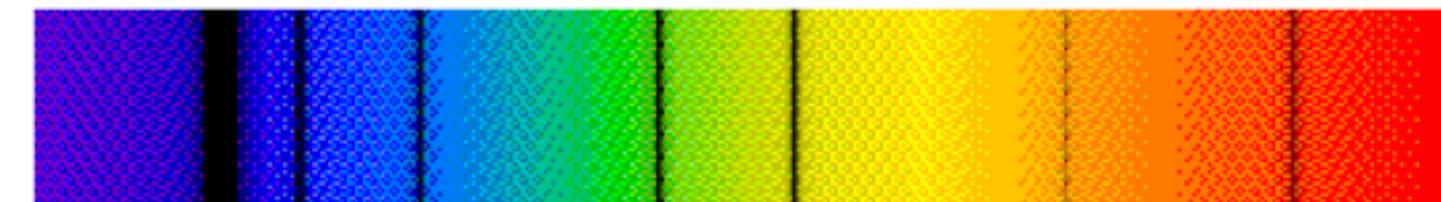
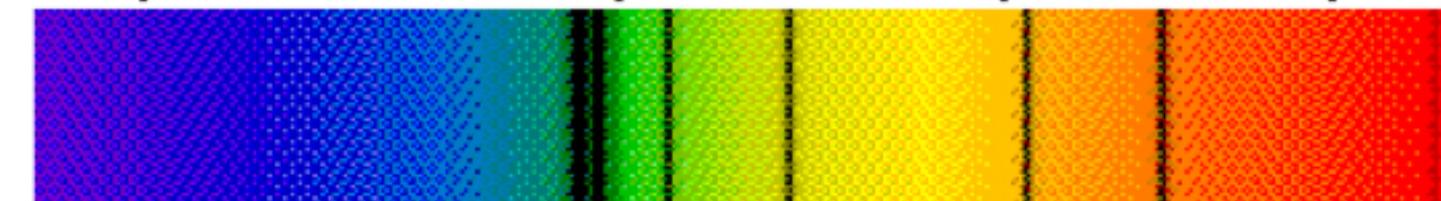
2. STANDARD CANDLES



$$\frac{\text{BRIGHTNESS}_1}{\text{BRIGHTNESS}_2} = \frac{r_2^2}{r_1^2}$$

Doppler Shift

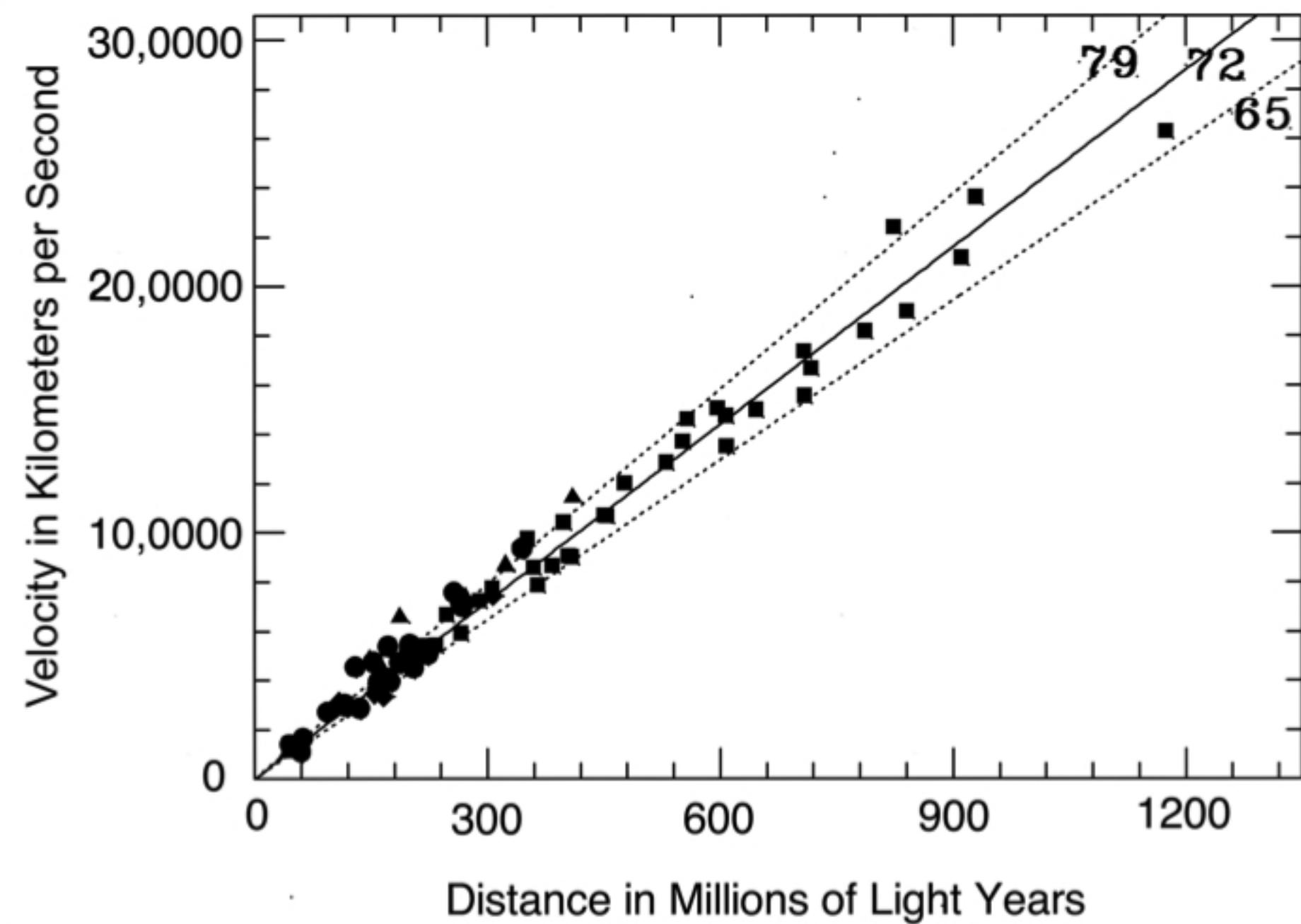
400 500 600 700



400 500 600 700

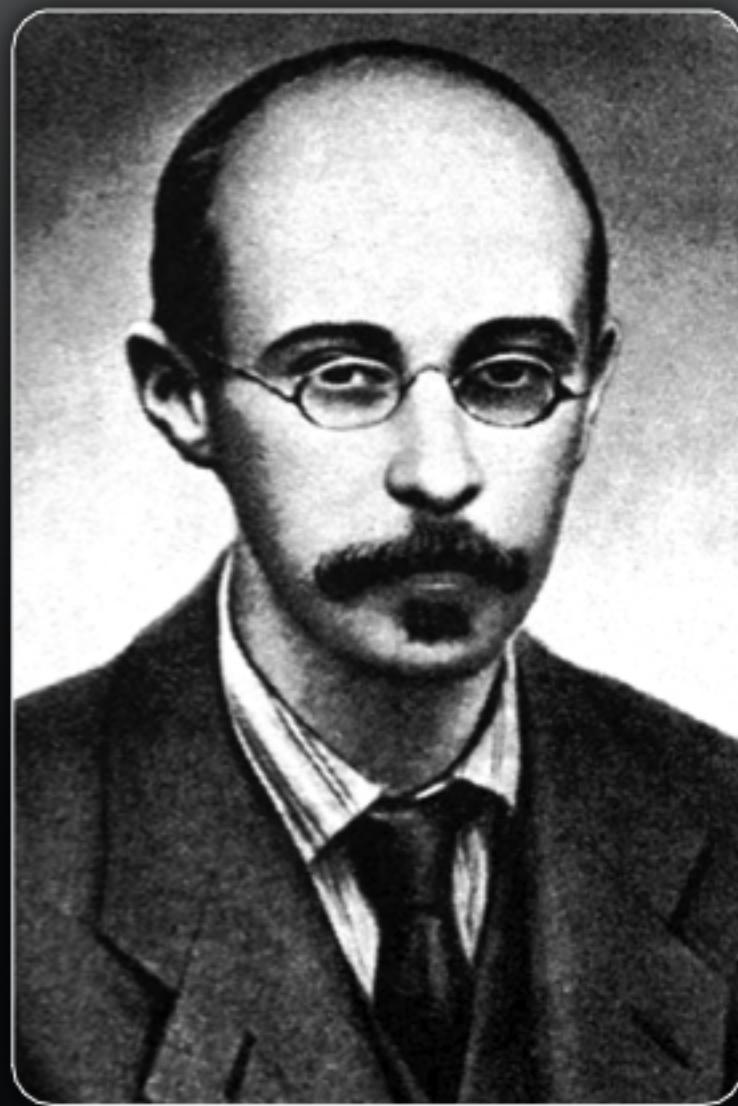
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Hubble's Law

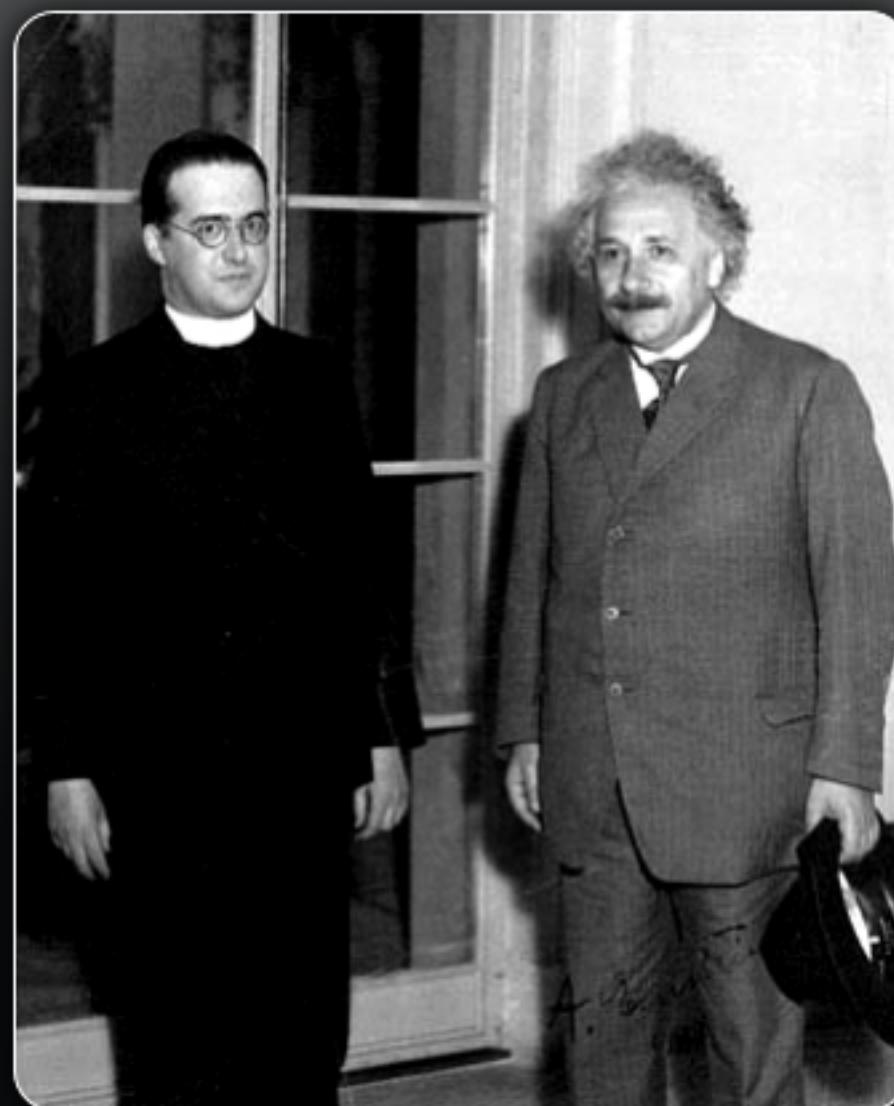


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Alexander Friedman



Georges Lemaître &
Albert Einstein



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George Gamow



Robert Herman



Ralph Alpher

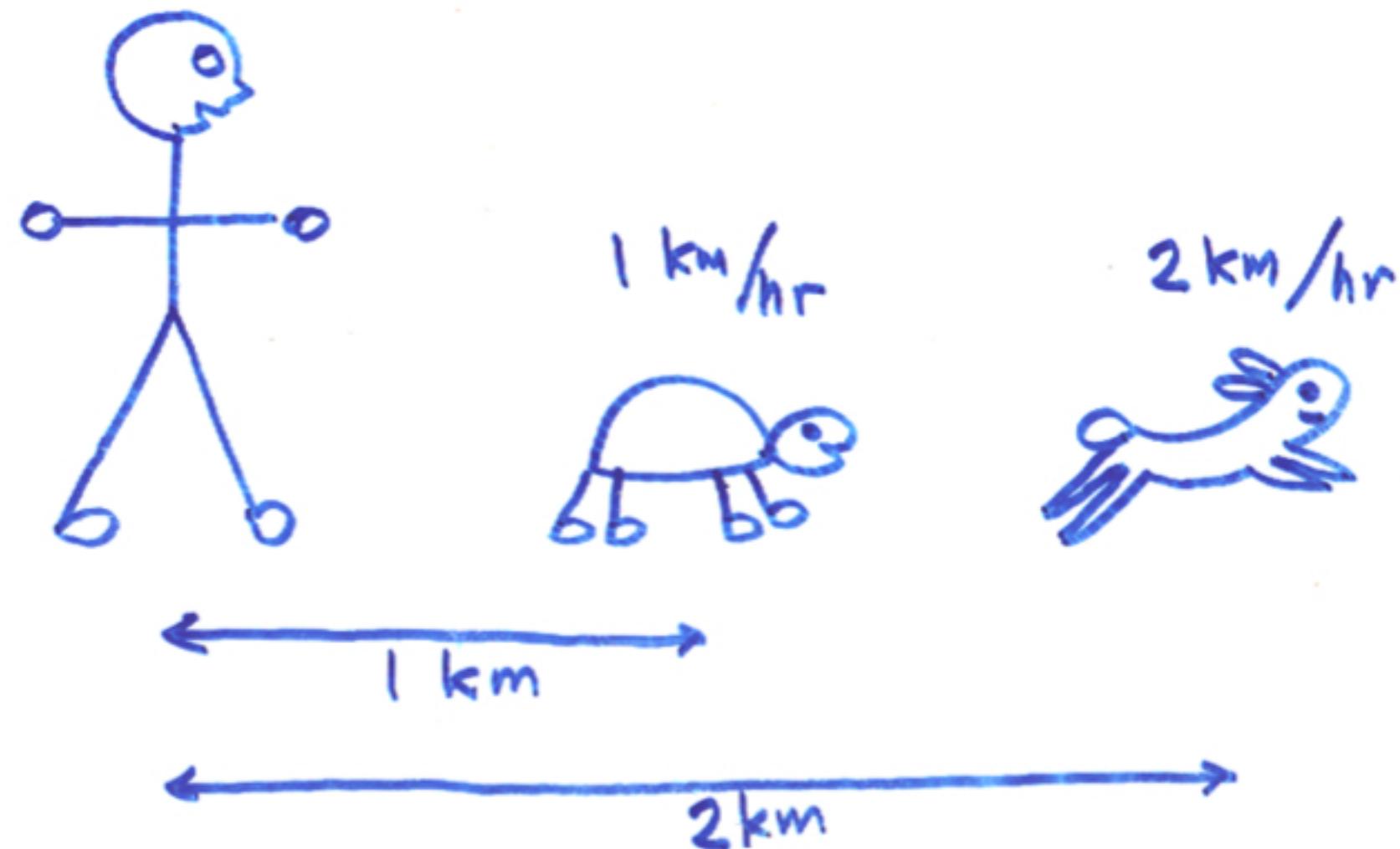


Scanned at the American Institute of Physics

HUBBETE'S LAW

NO NECESSARY CENTER!

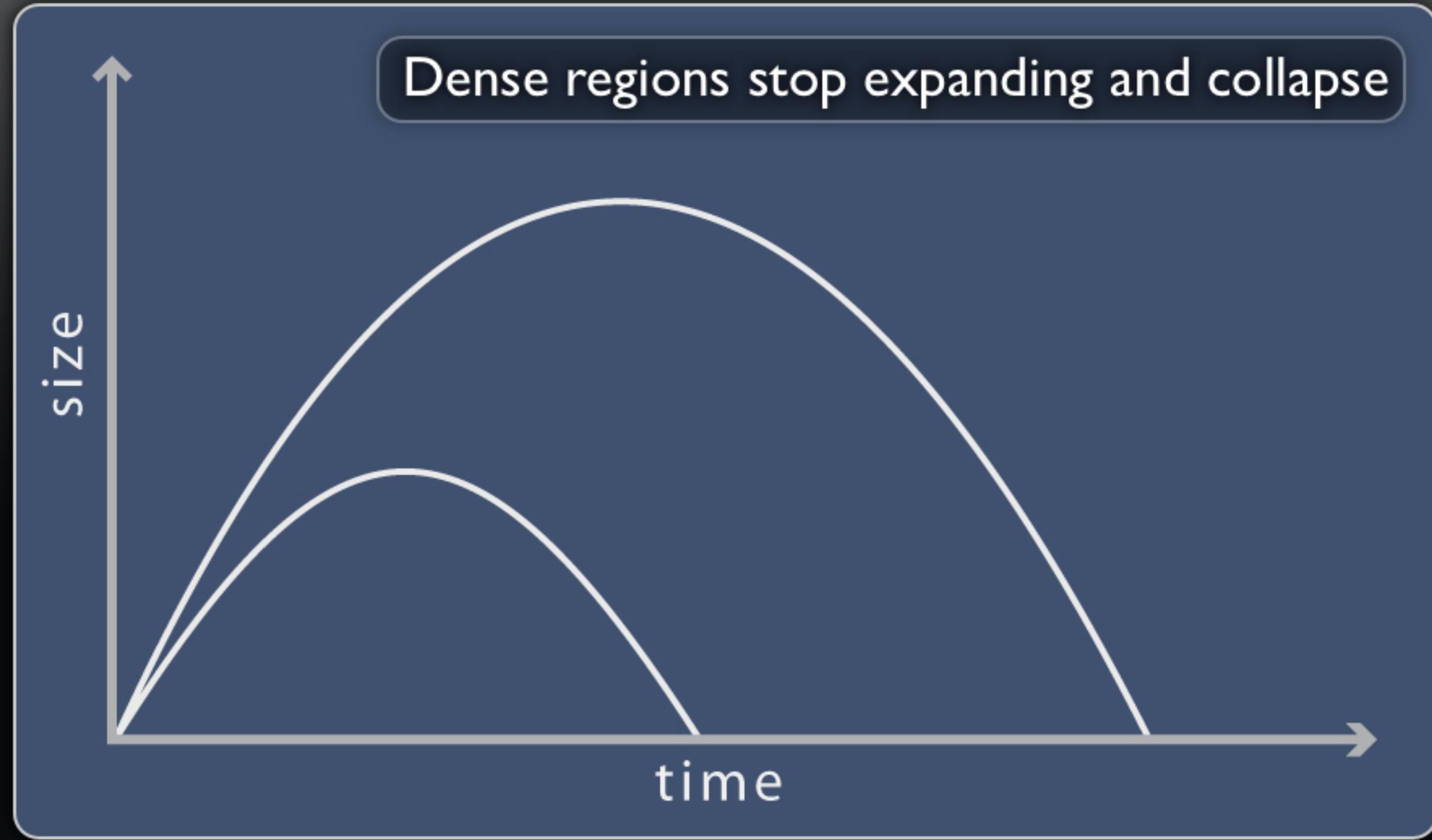
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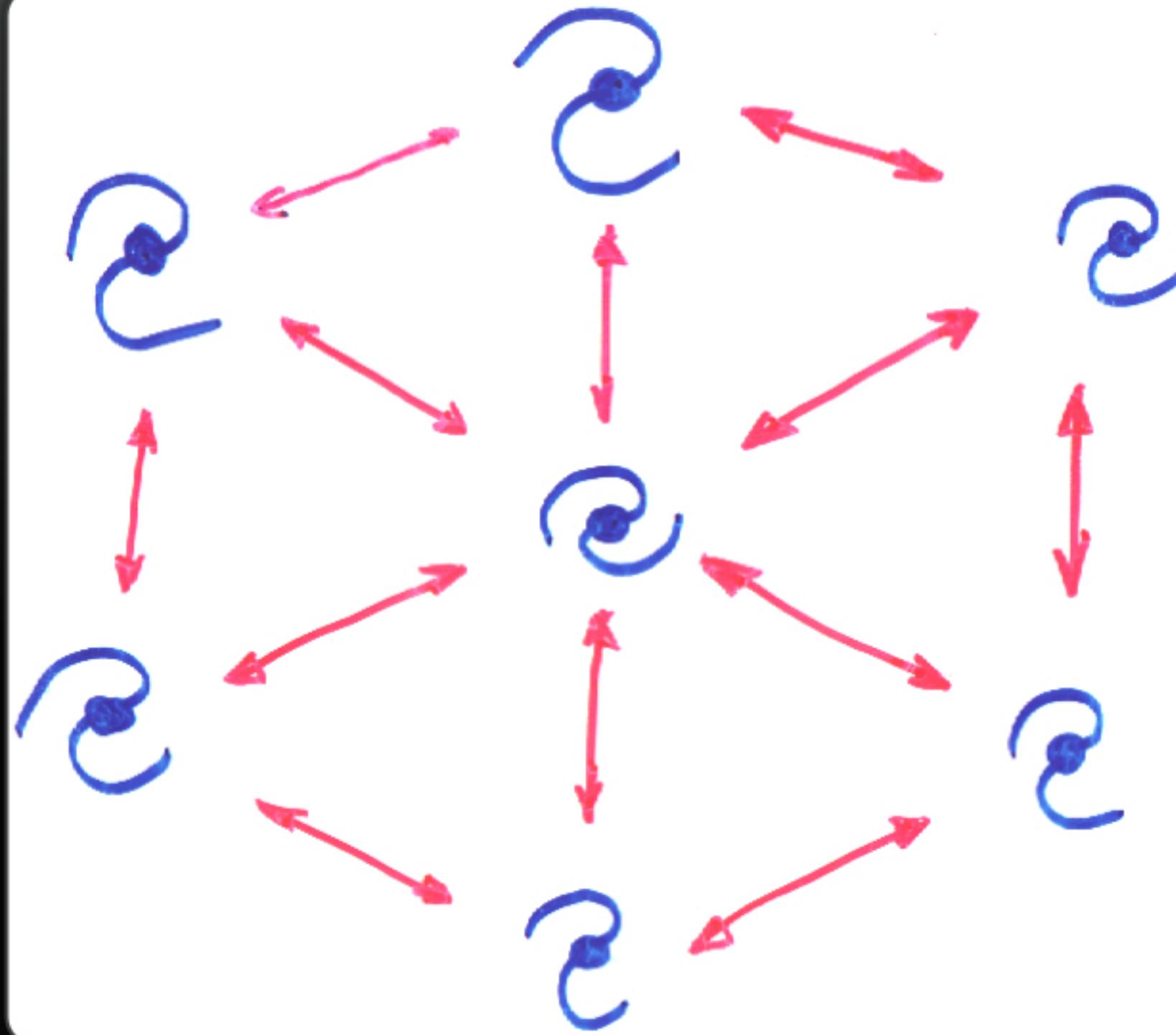
Big Bang



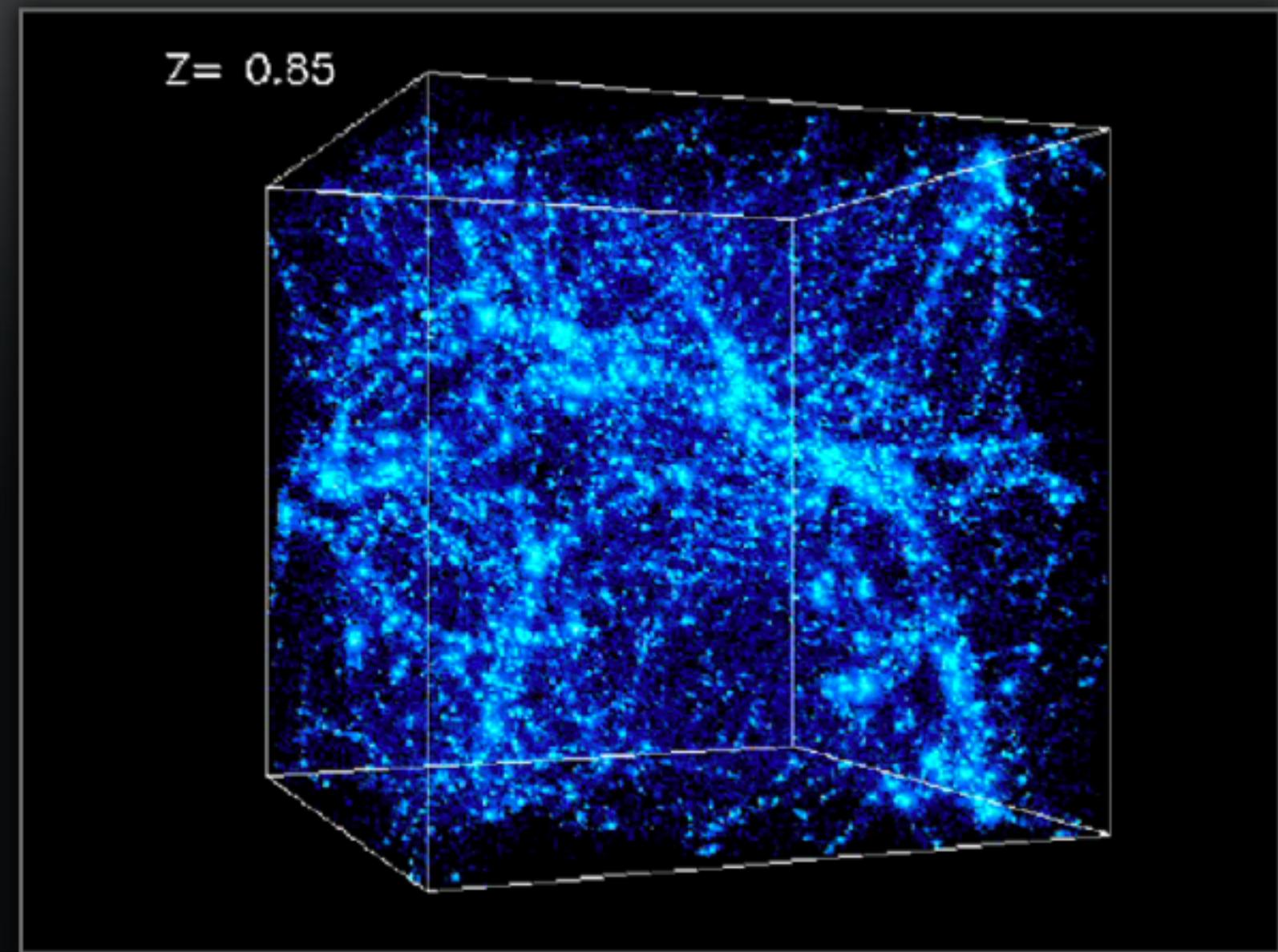
If an atom was the size of Earth, the nucleus would equal the size of two Good Year blimps.



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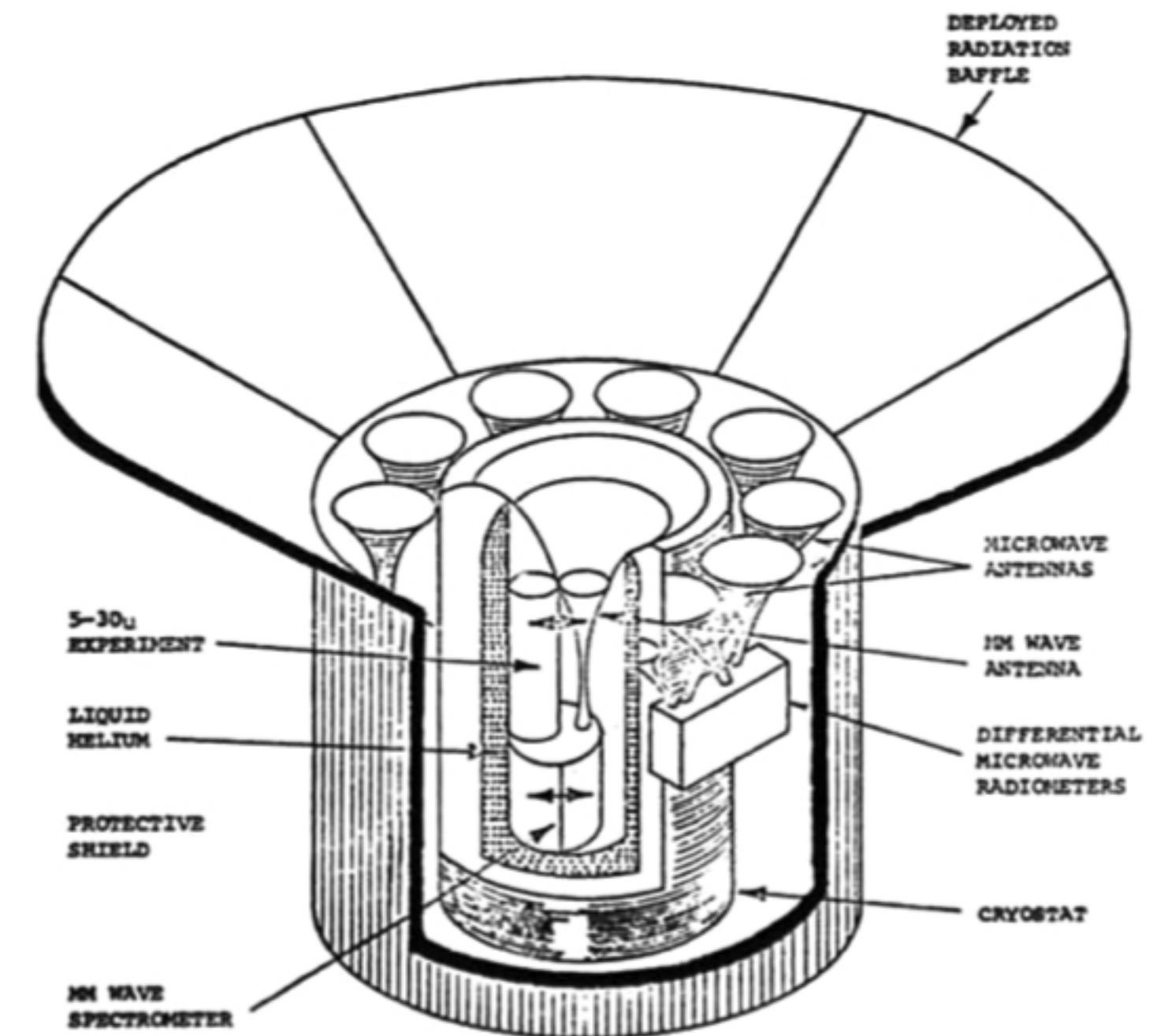


How the universe (might have) made galaxies



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ARRANGEMENT OF EXPERIMENTS

TWO HELIUM COOLED EXPERIMENTS
TIME-SHARE THE APERTURE IN THIS VERSION

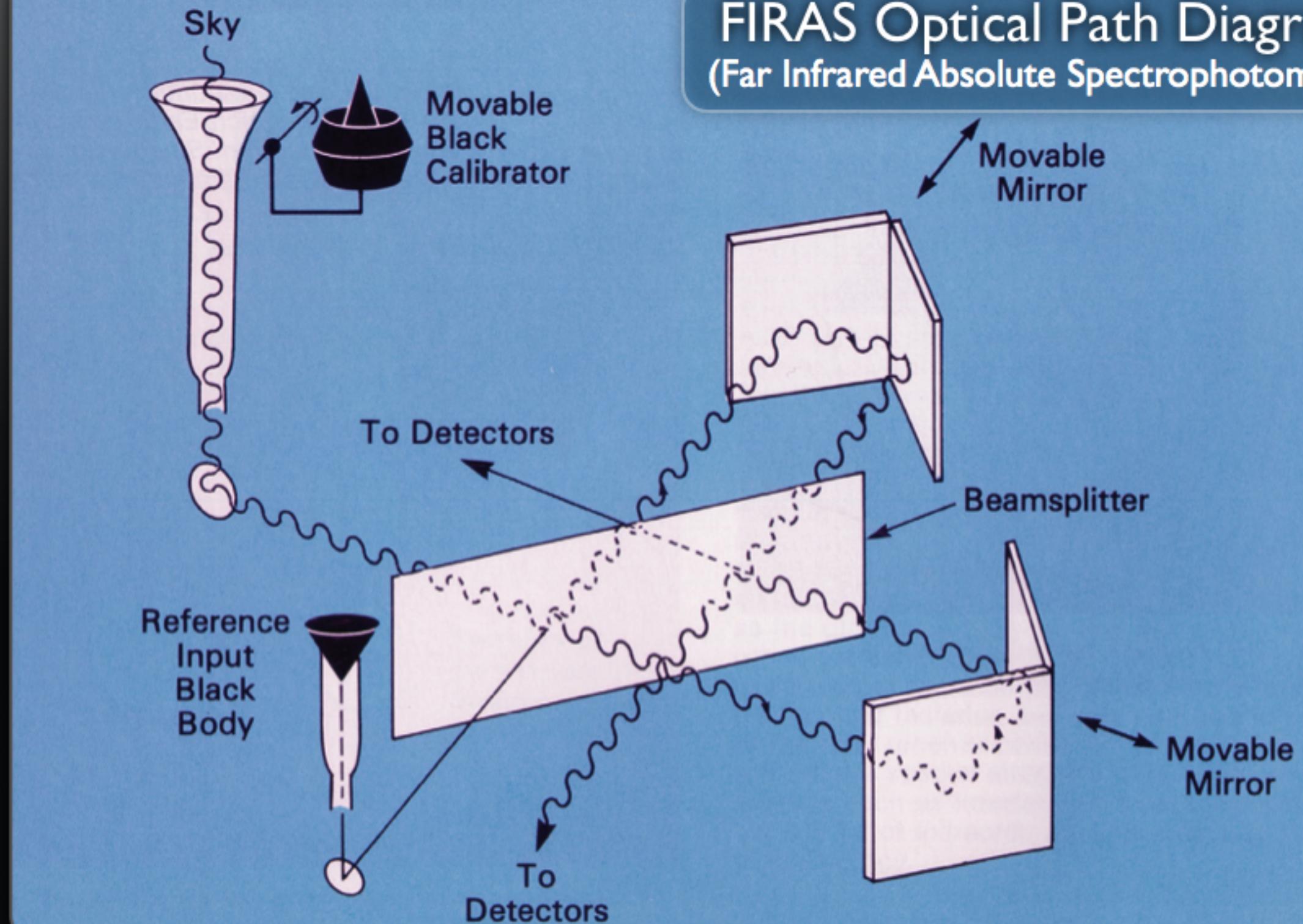
INSTRUMENT ARRANGEMENT ON PROPOSED SPACECRAFT



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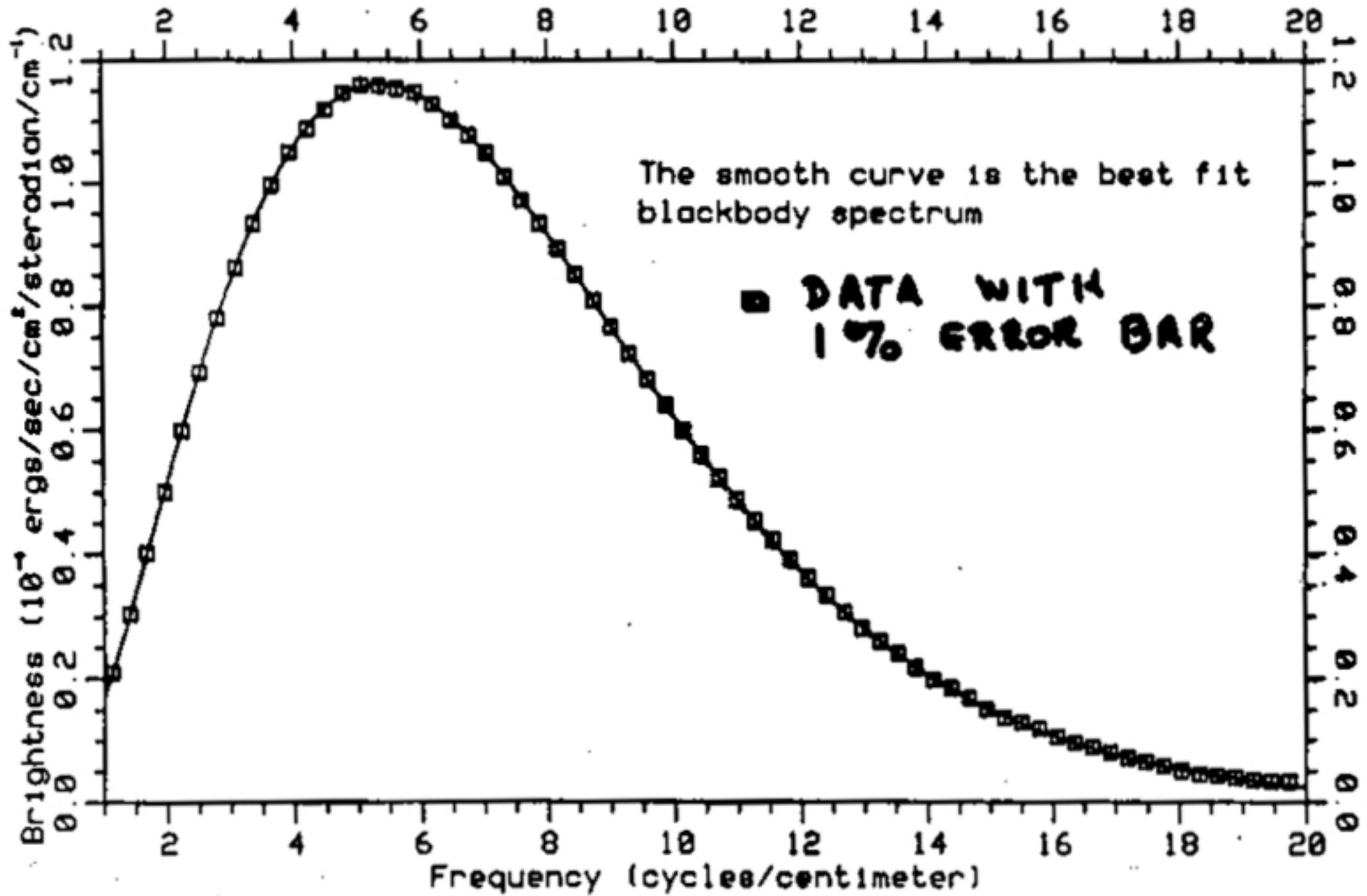
FIRAS Optical Path Diagram

(Far Infrared Absolute Spectrophotometer)



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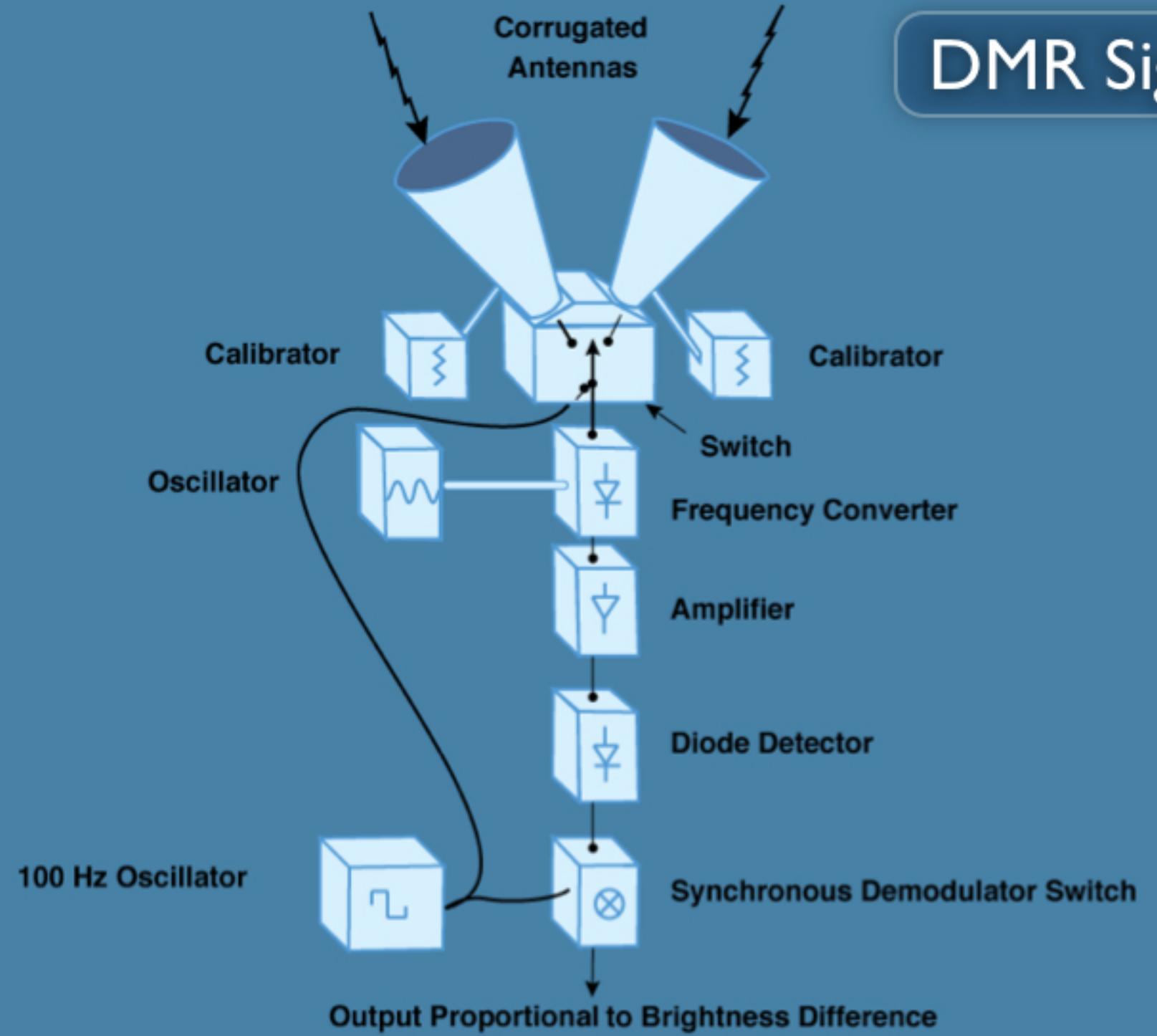
Cosmic Background Spectrum at the North Galactic Pole



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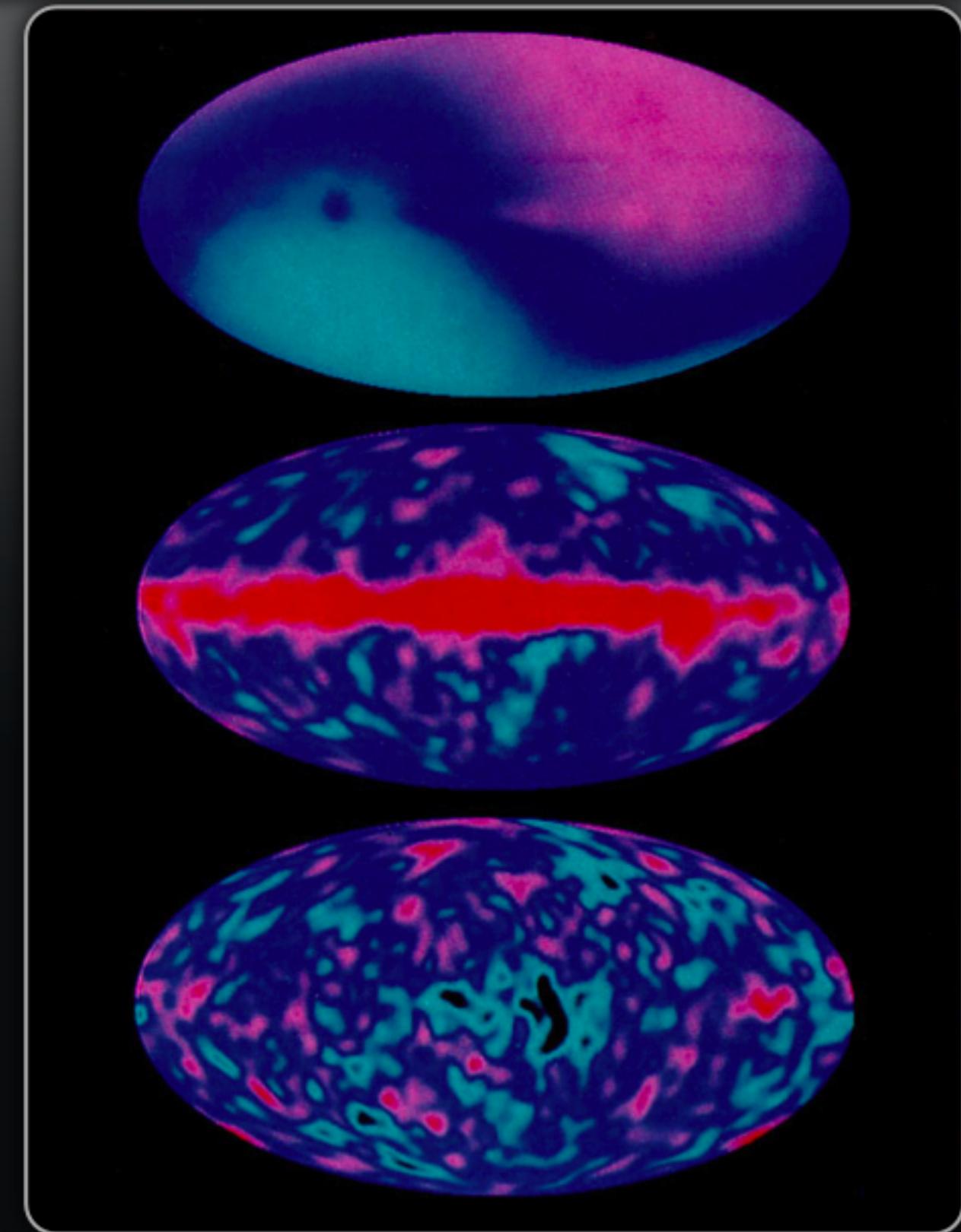
DMR Signal Flow





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Nobel Prize Press Release

“The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Physics for 2006 jointly to John C. Mather, NASA Goddard Space Flight Center, Greenbelt, MD, USA, and George F. Smoot, University of California, Berkeley, CA, USA "for their discovery of the blackbody form and anisotropy of the cosmic microwave background radiation.”

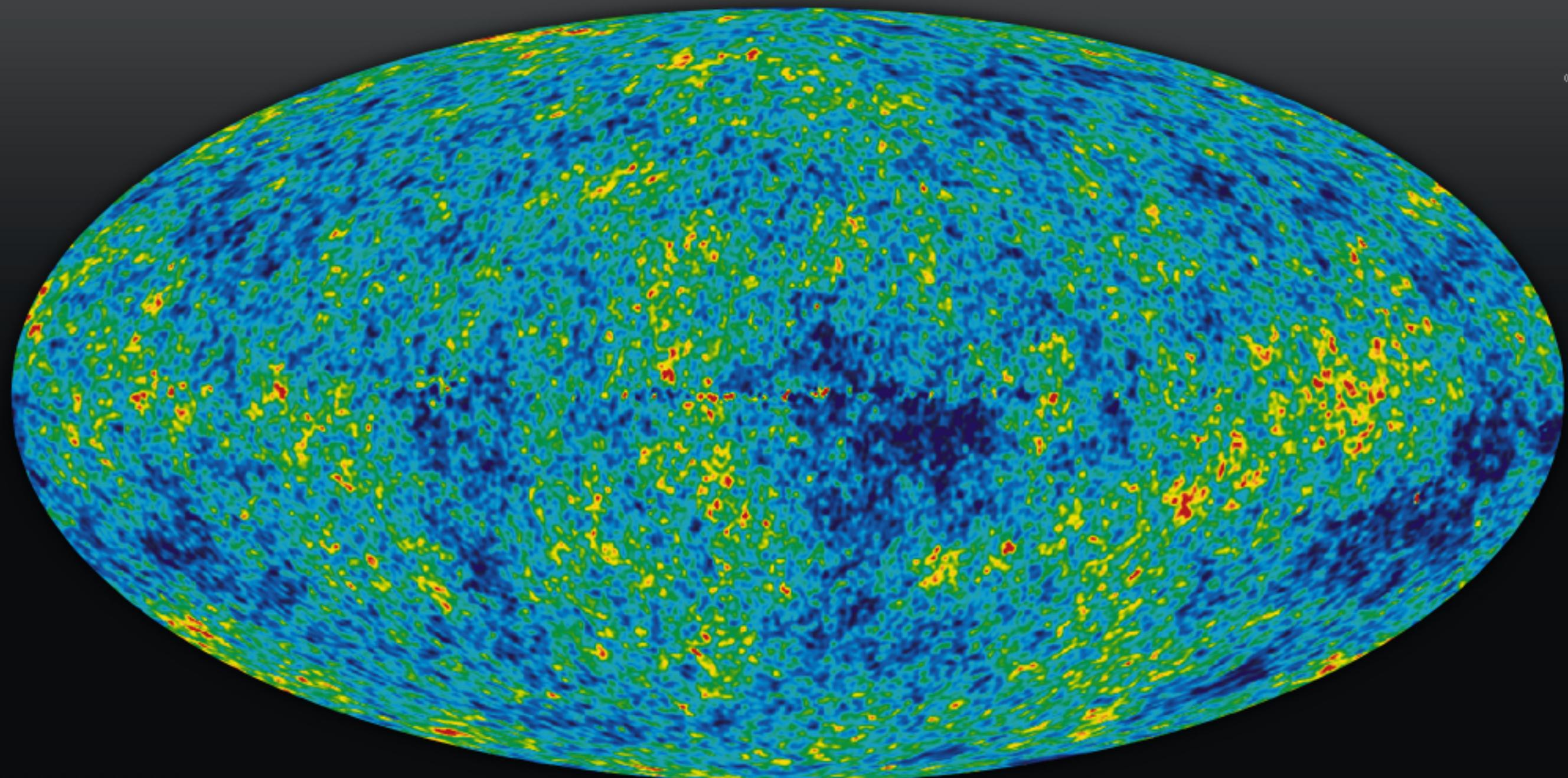


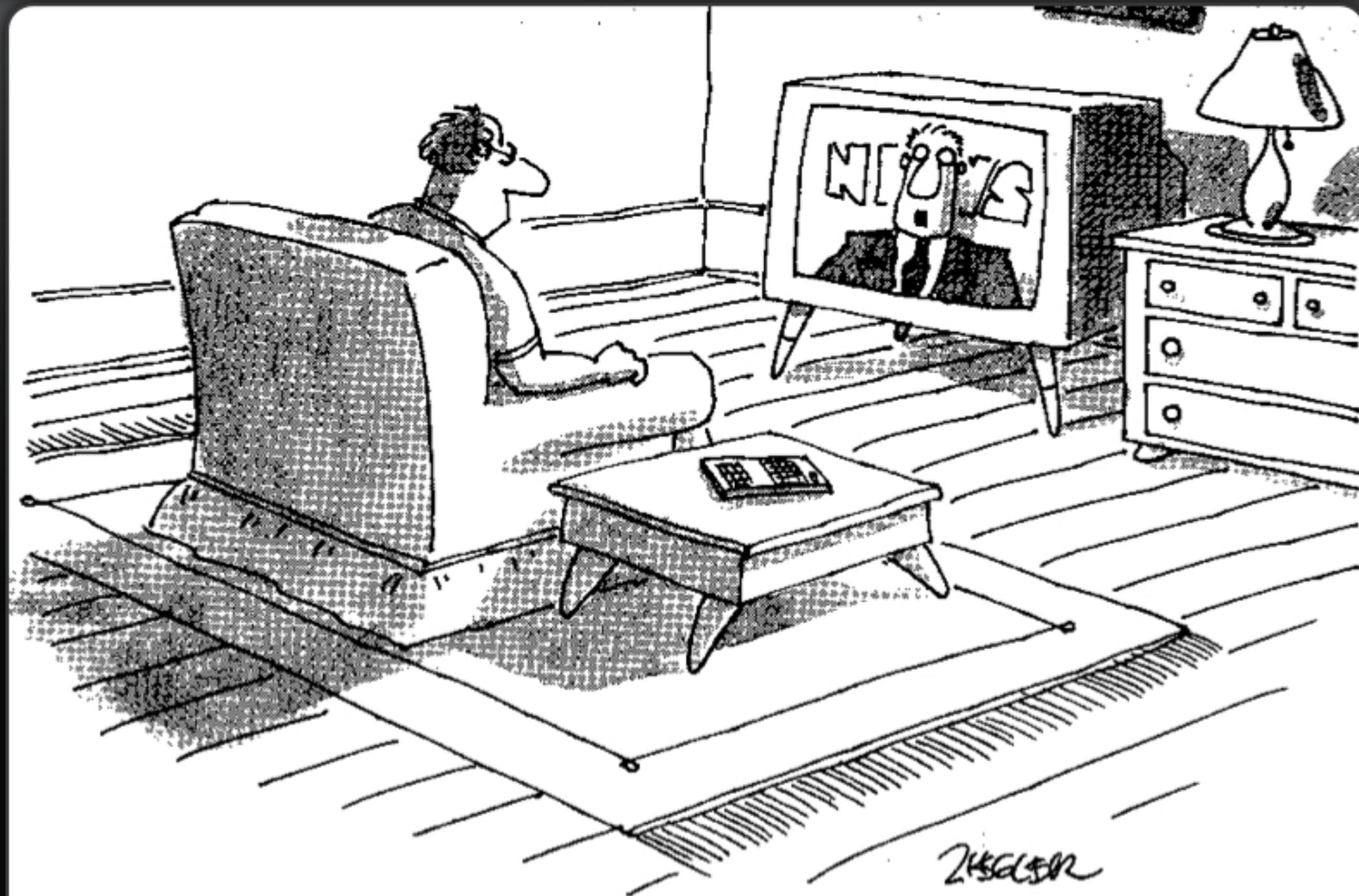
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Universe at age 389,000 years

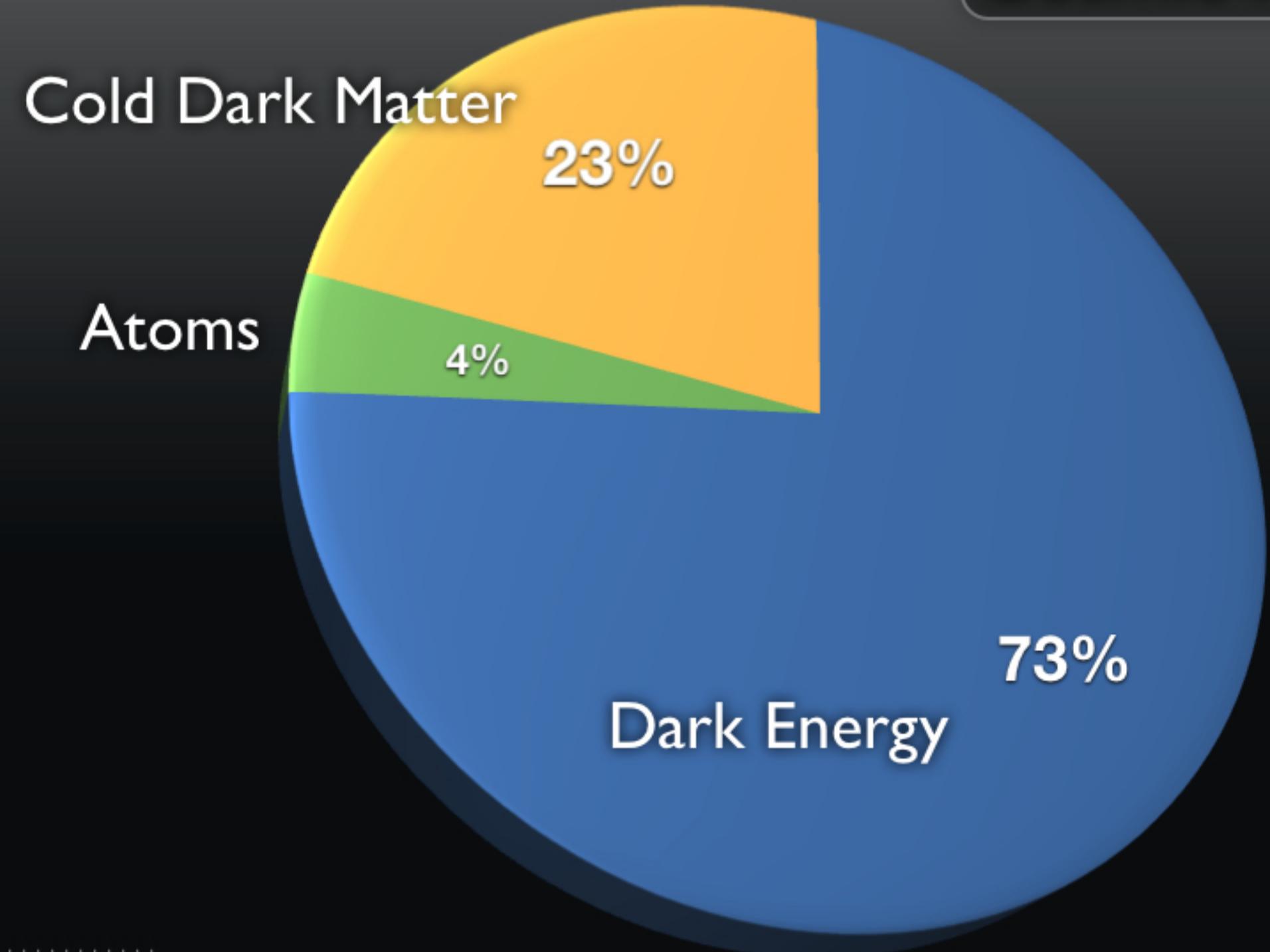
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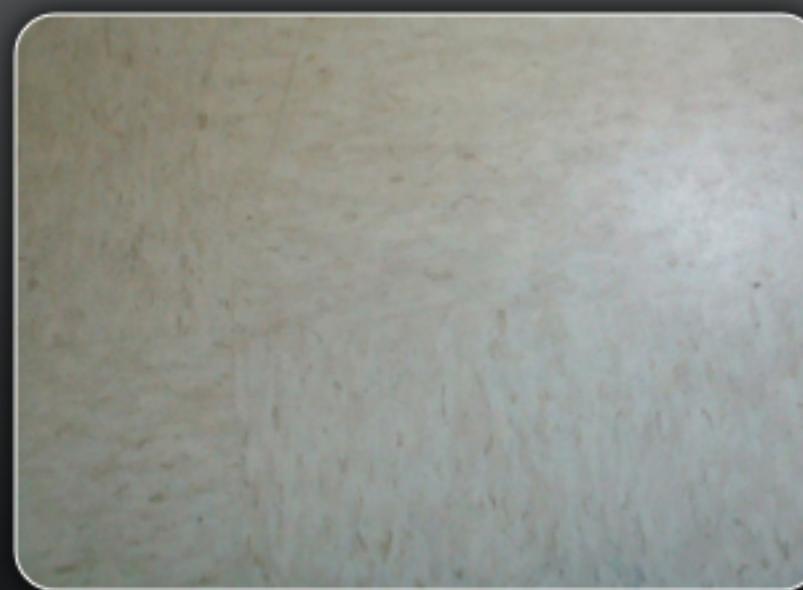


“Scientists confirmed today that everything we know about the structure of the universe is wrongedy-wrong-wrong.”

Cosmic Parameters



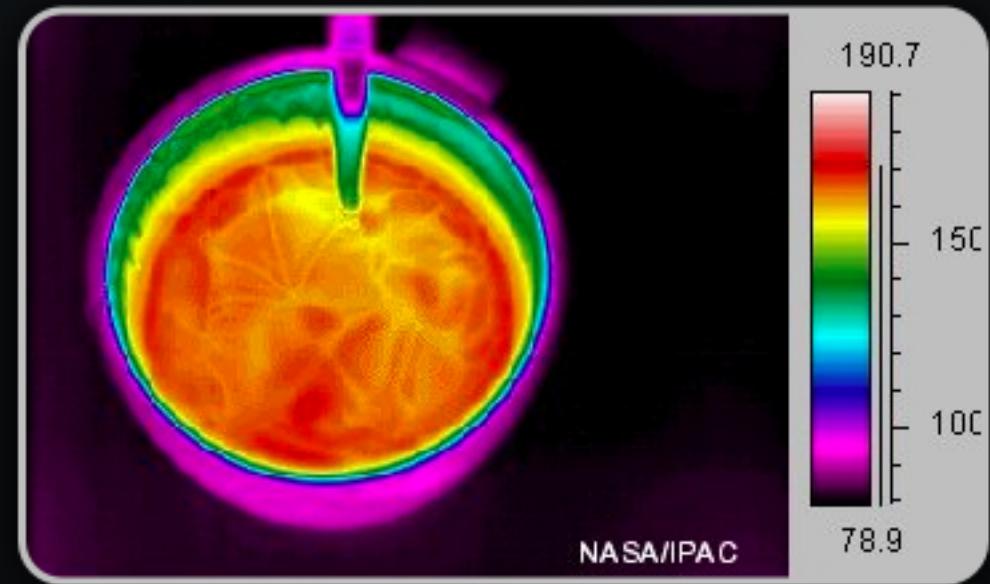
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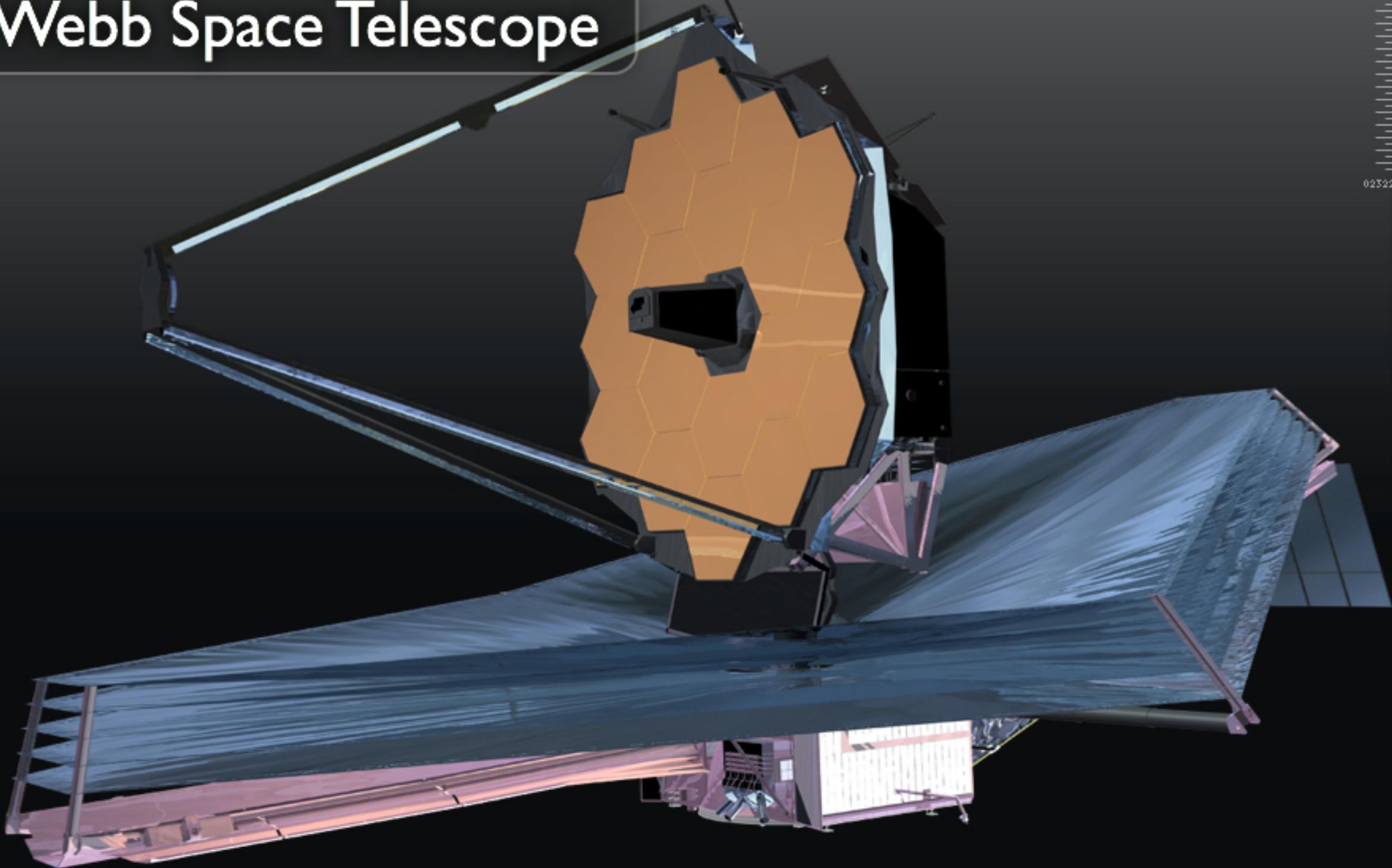
Visible



Infrared



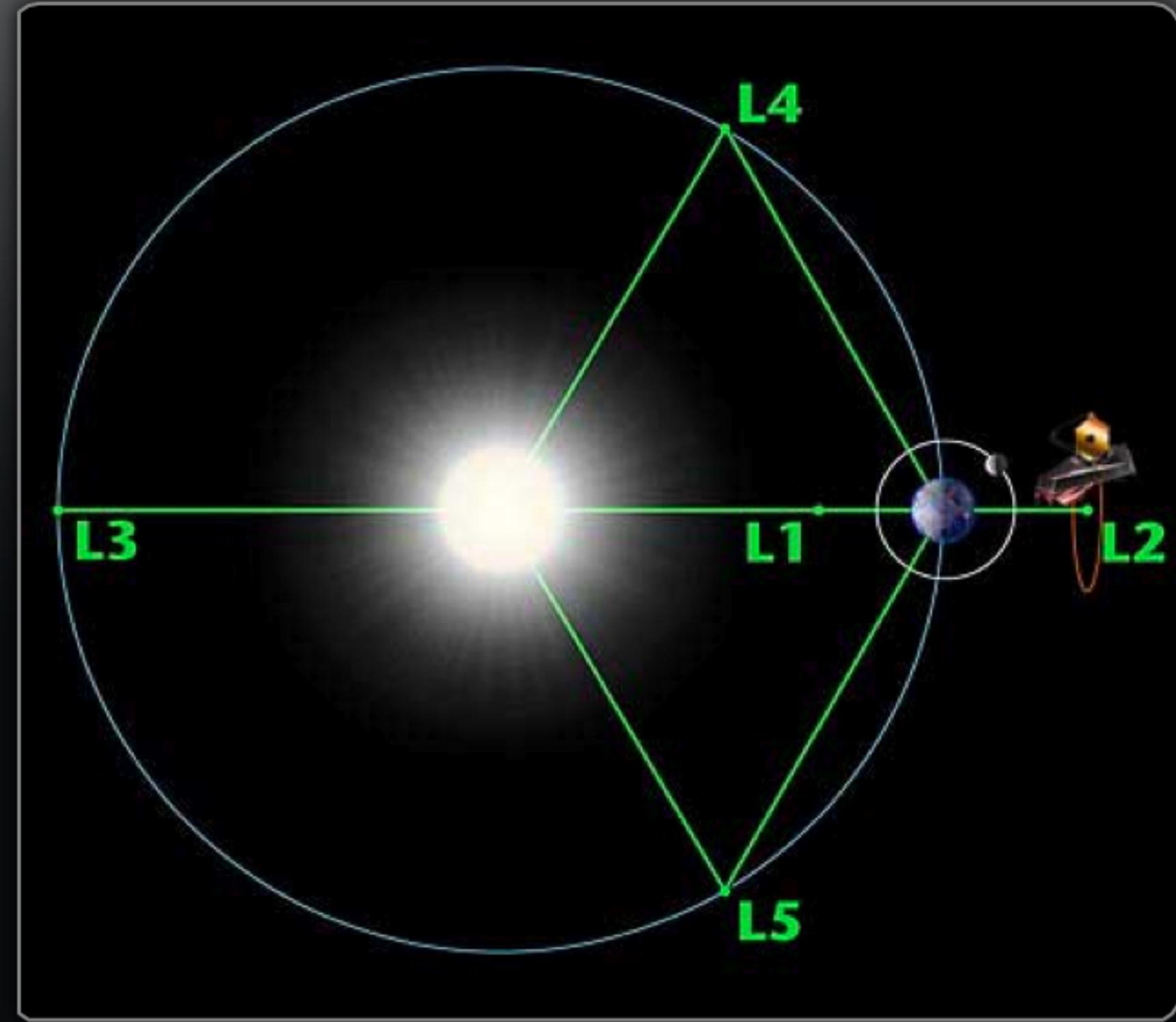
James Webb Space Telescope



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JWST Orbit

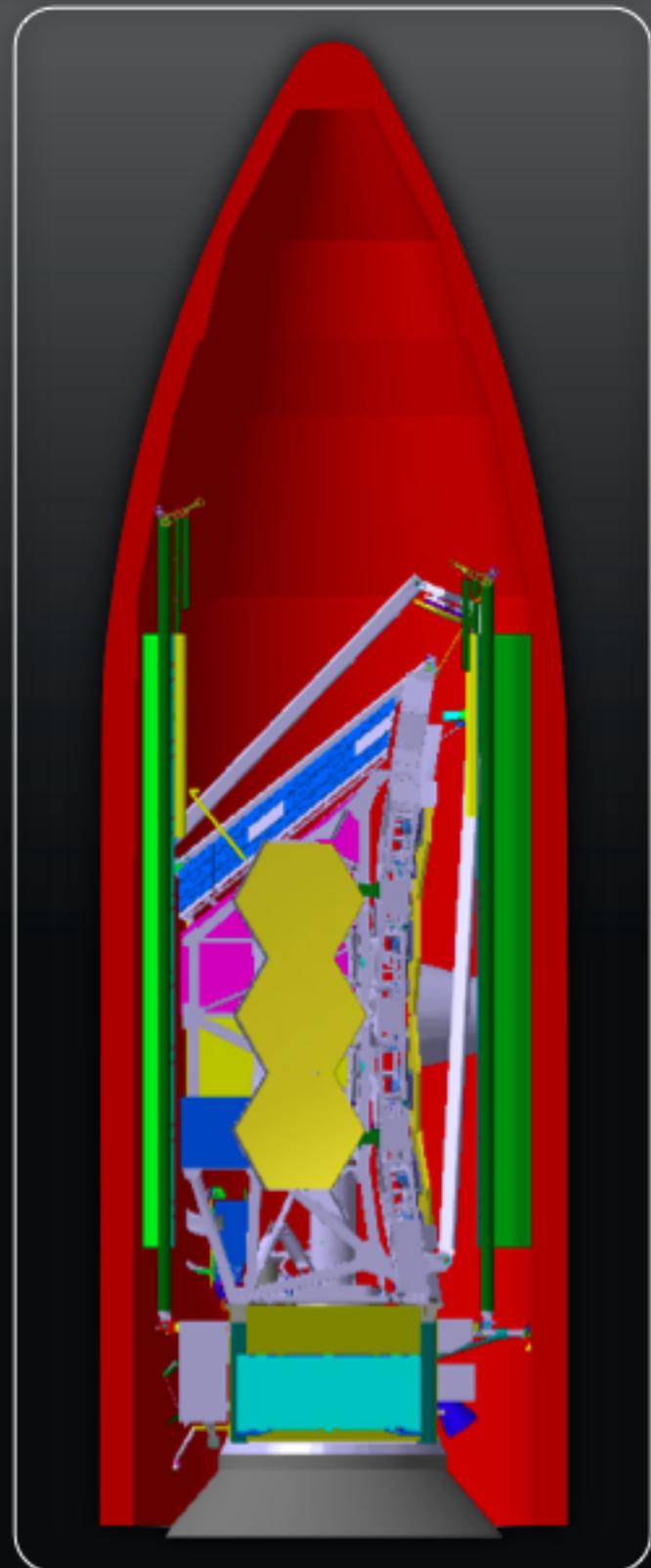


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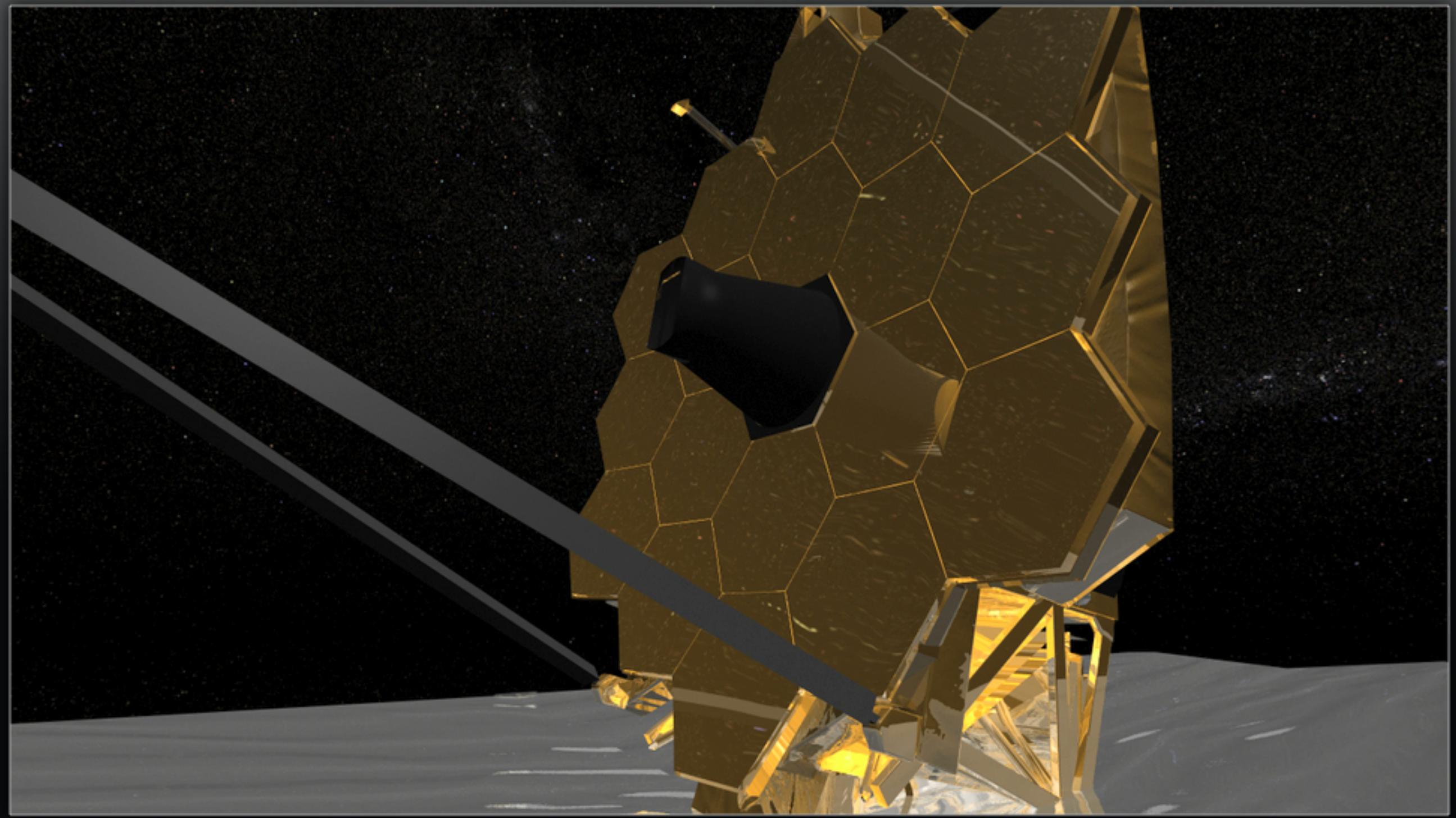


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JWST in Ariane 5 fairing



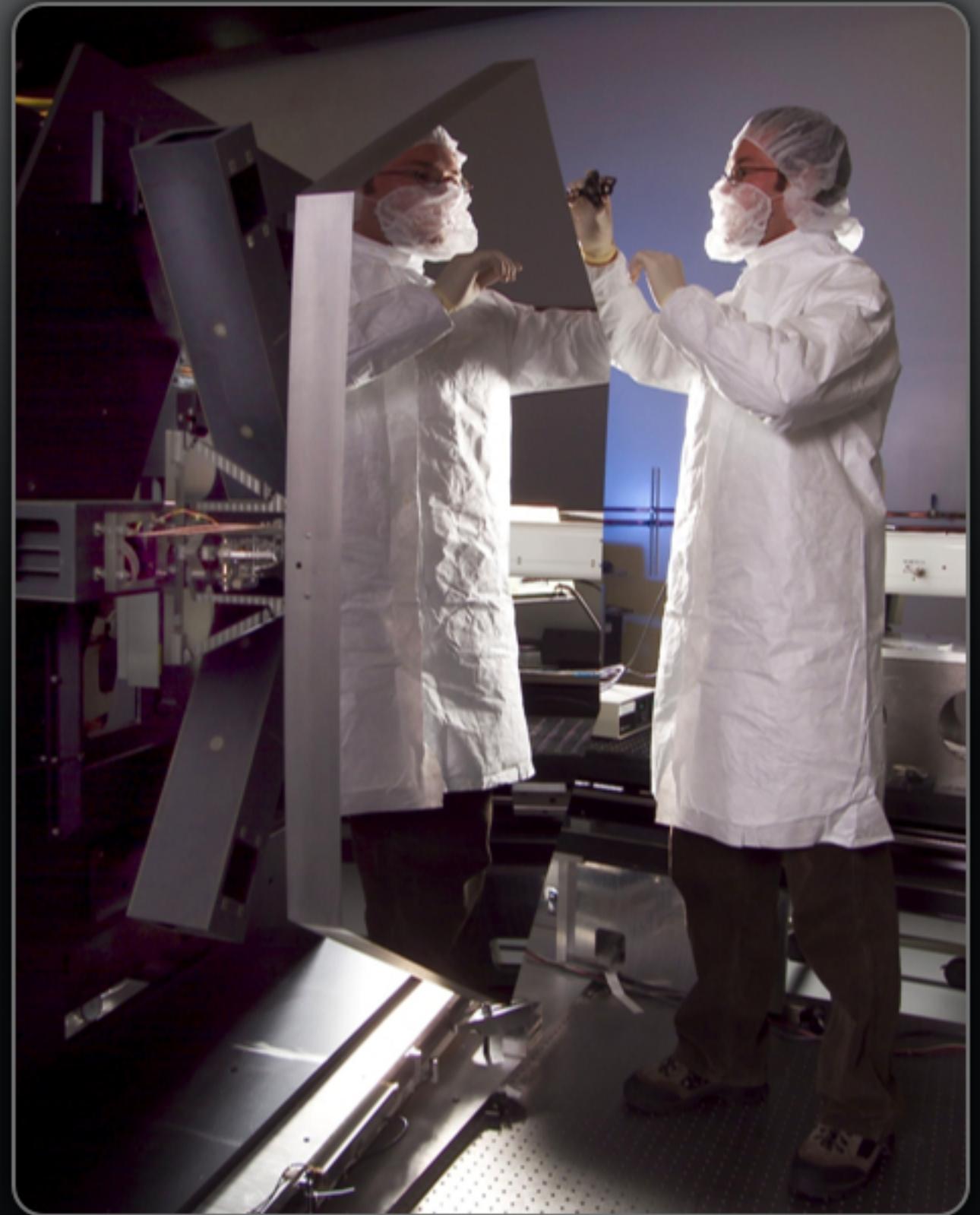
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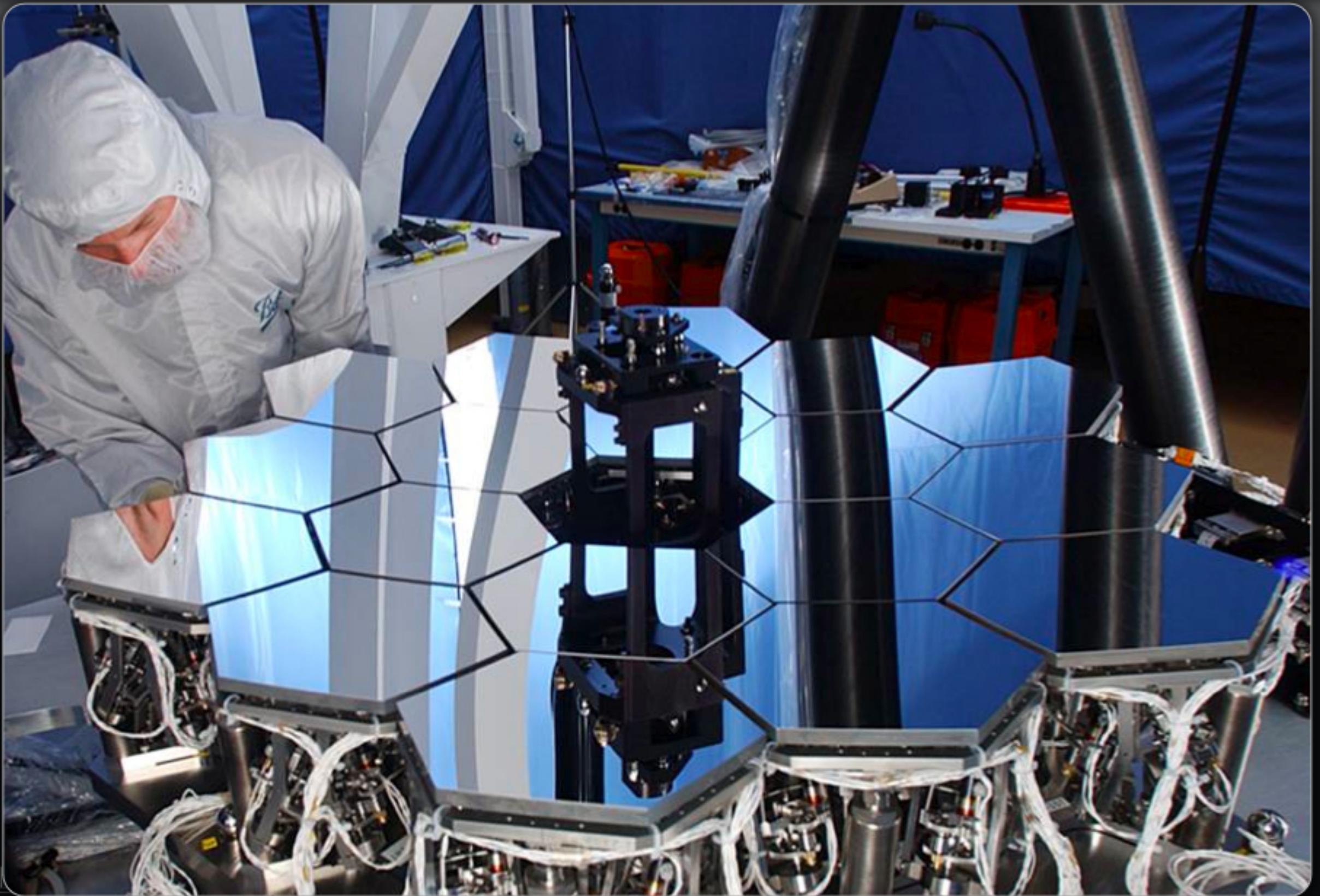


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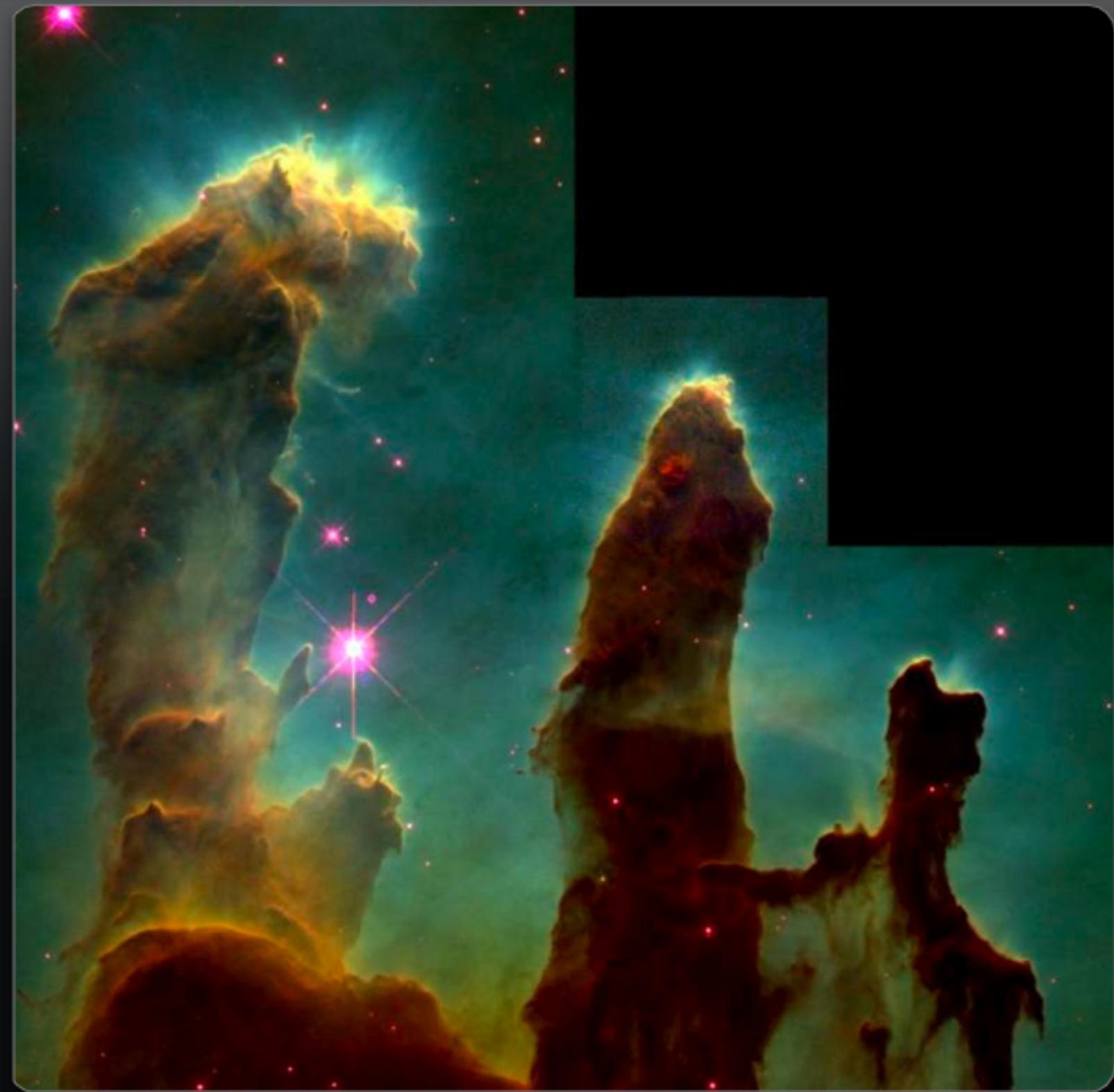
Galaxies Collide!



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Stars in dust disks in Orion



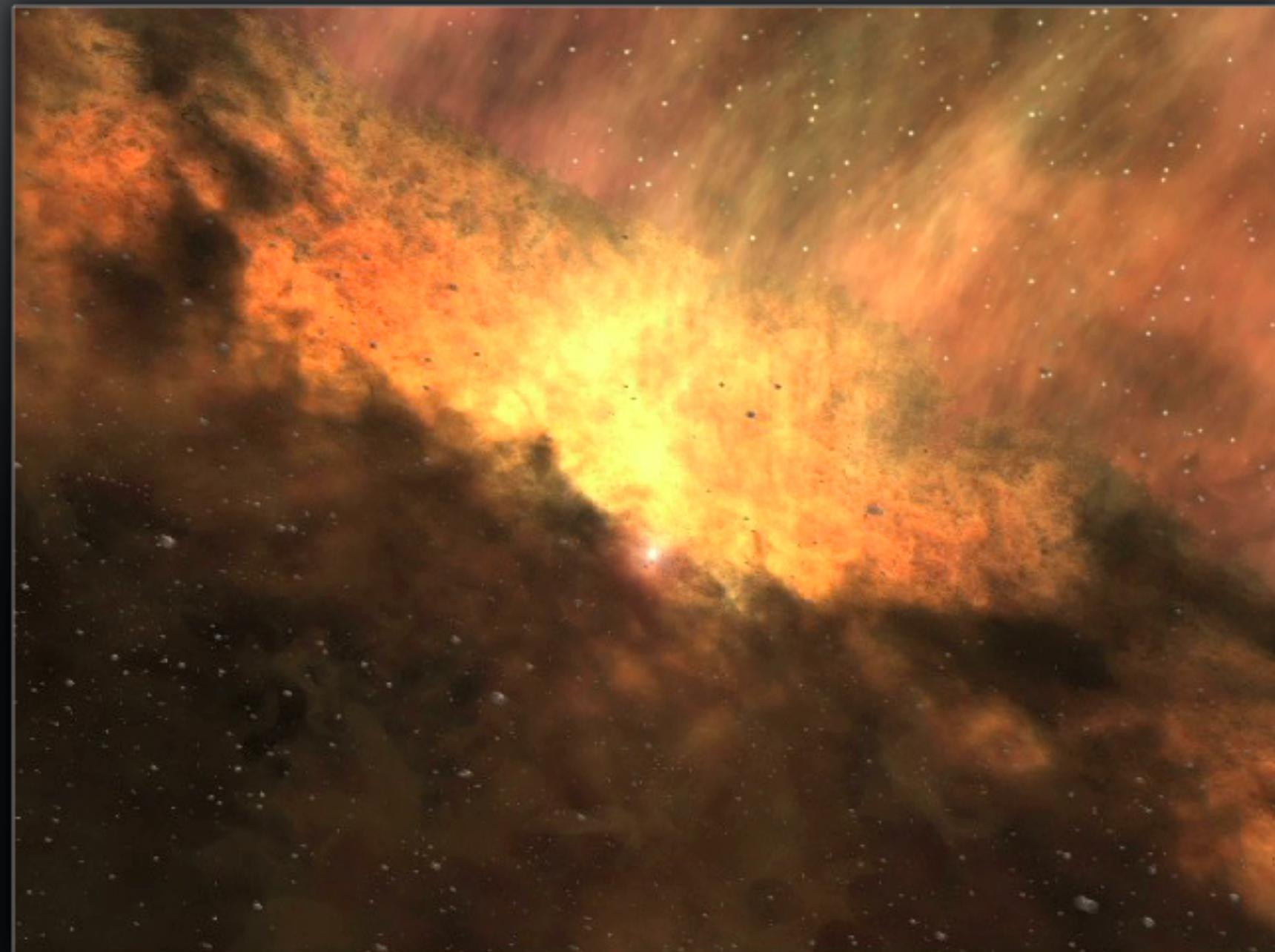
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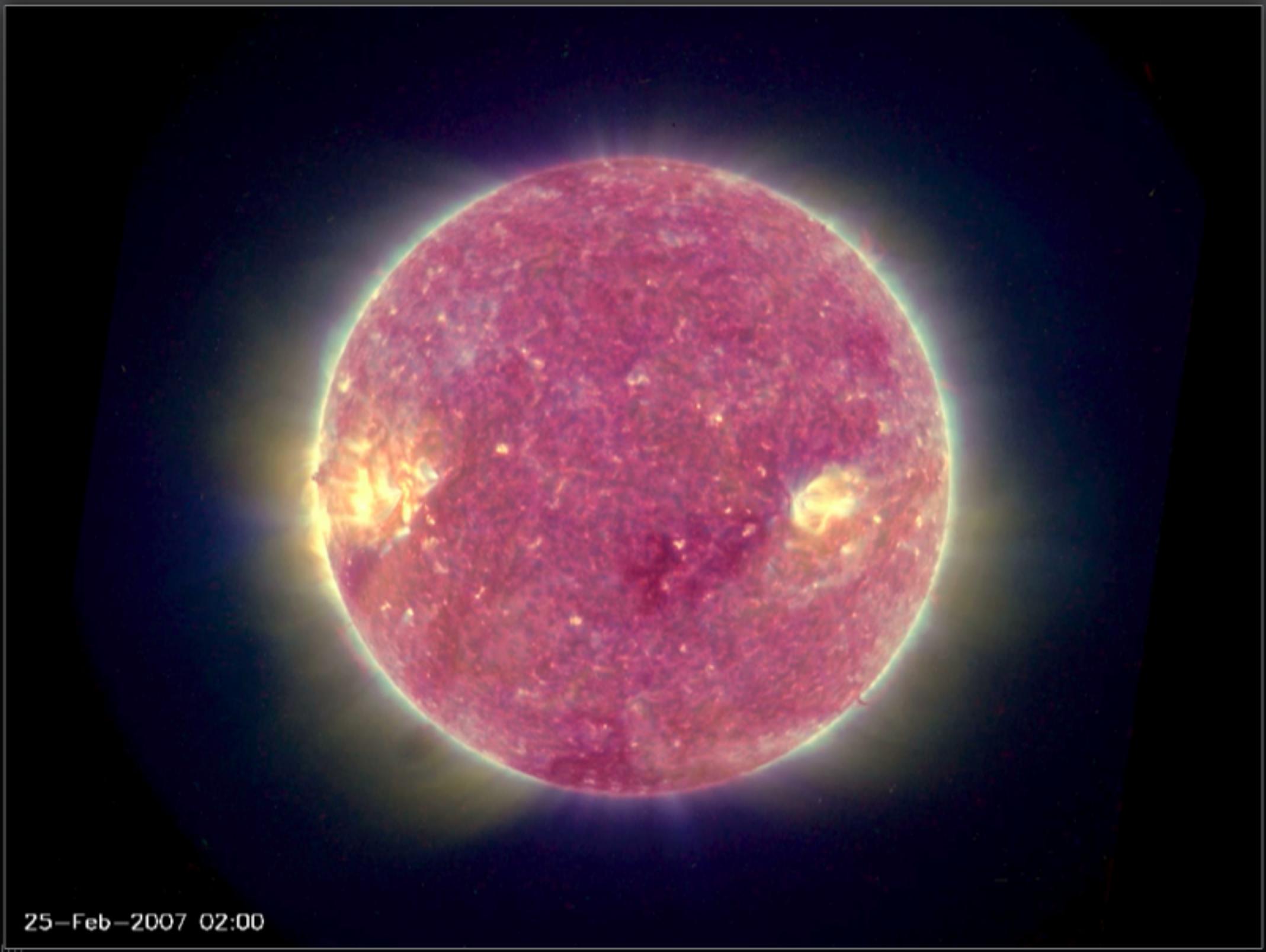
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The star Fomalhaut

Center of
offset dust ring

Offset
dust ring

Hypothetical planet
(estimated to be orbiting between
4.6 and 6.5 billion miles
from the star)

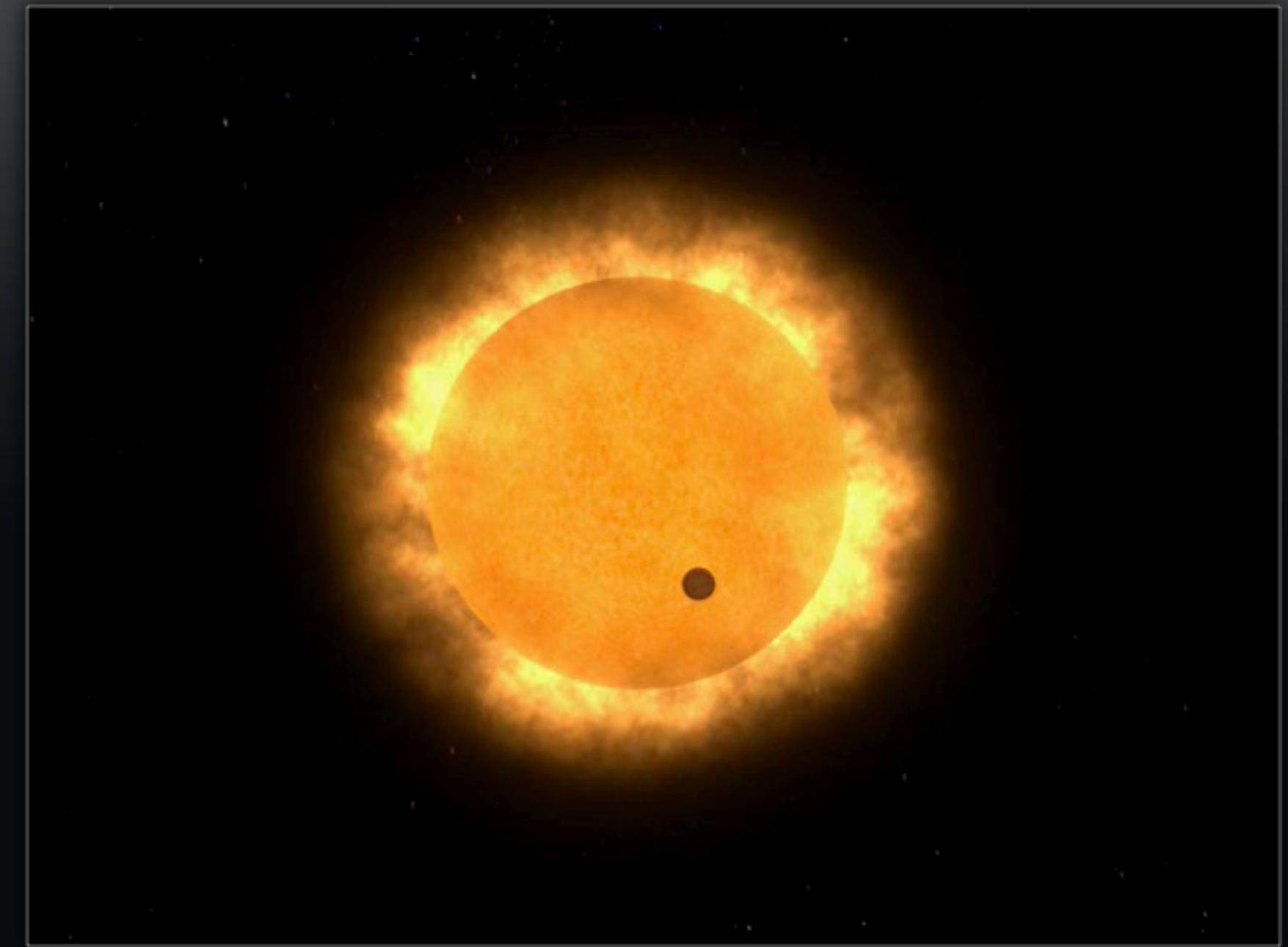


25-Feb-2007 02:00



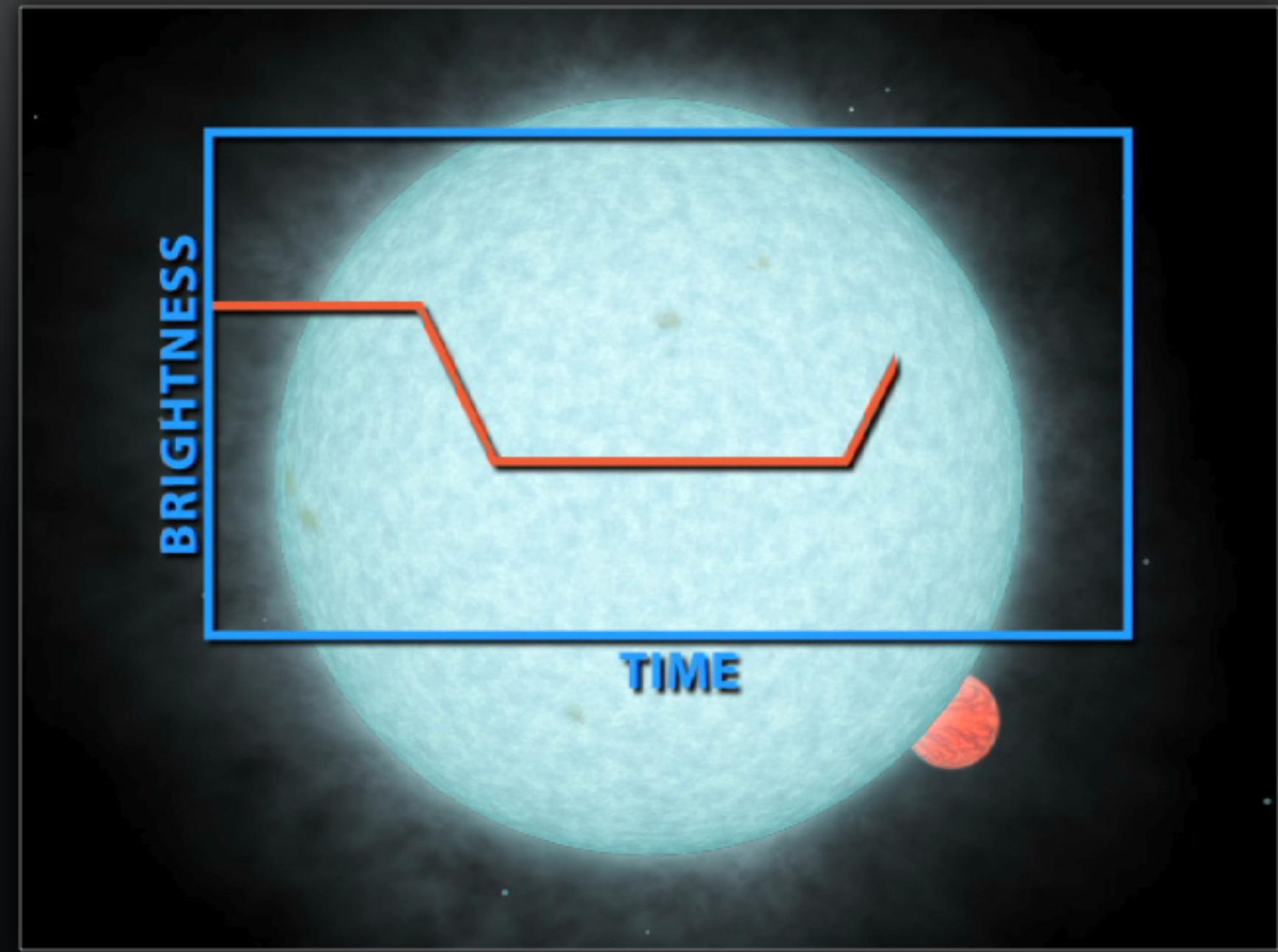
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Primary

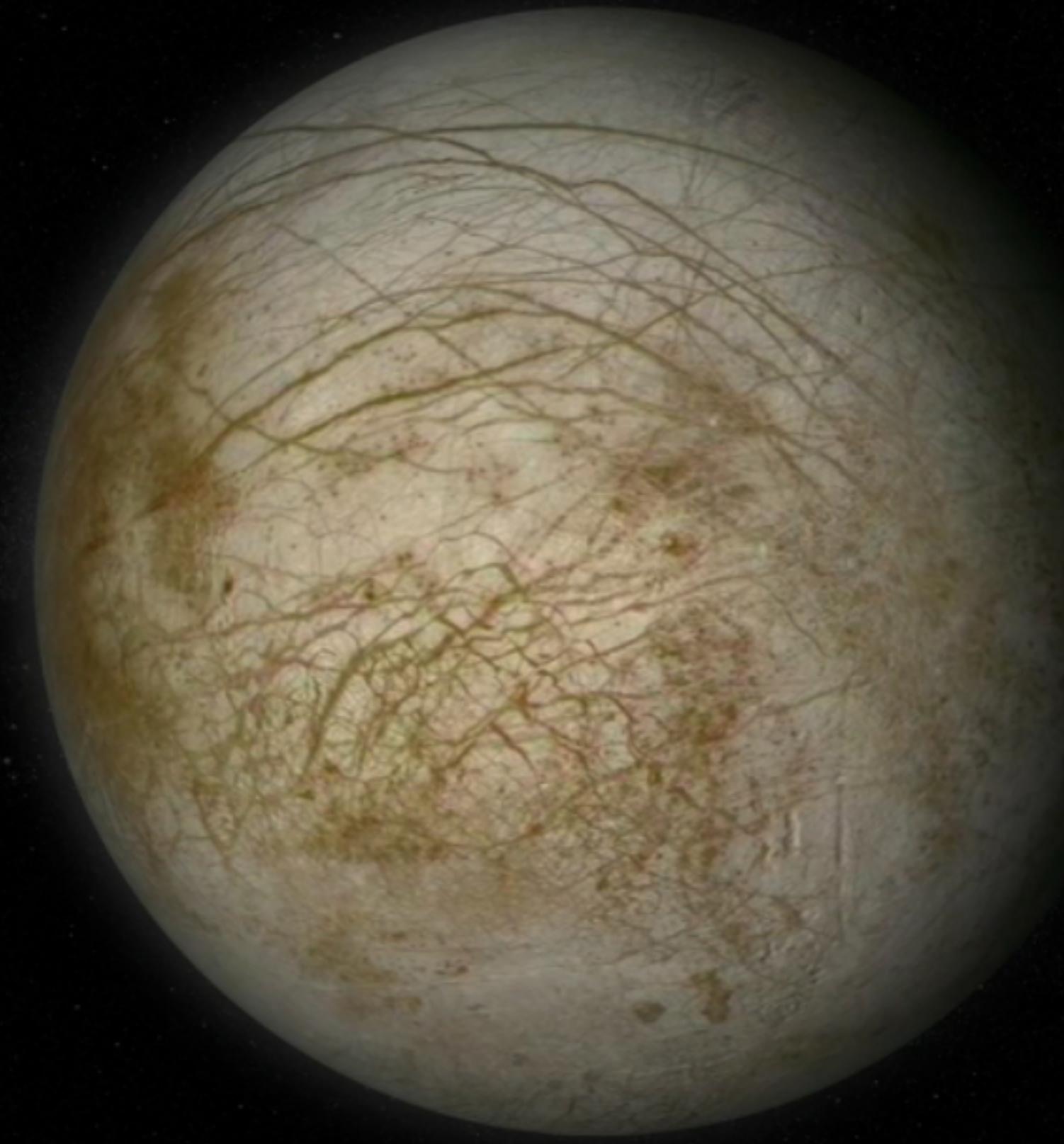


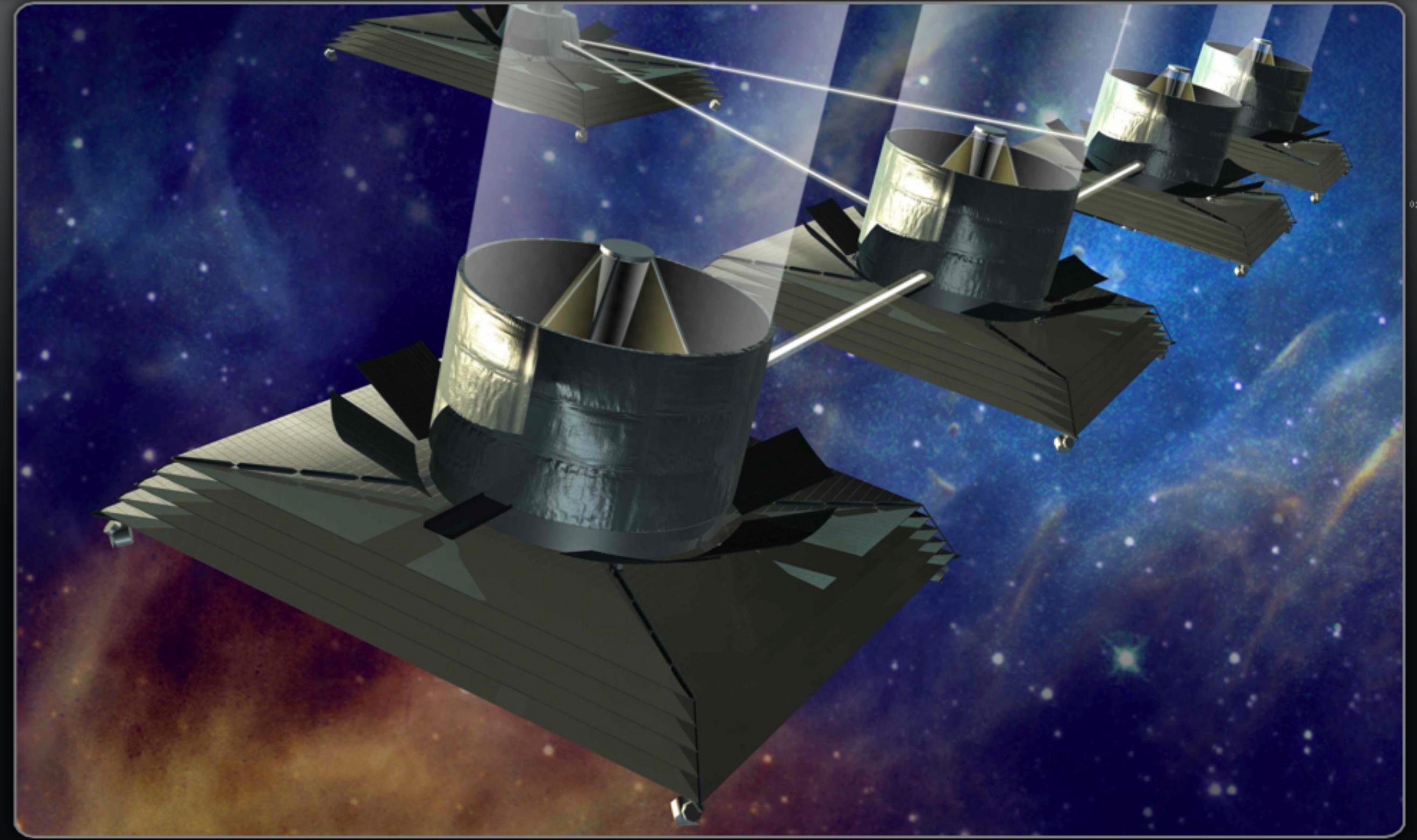
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Secondary



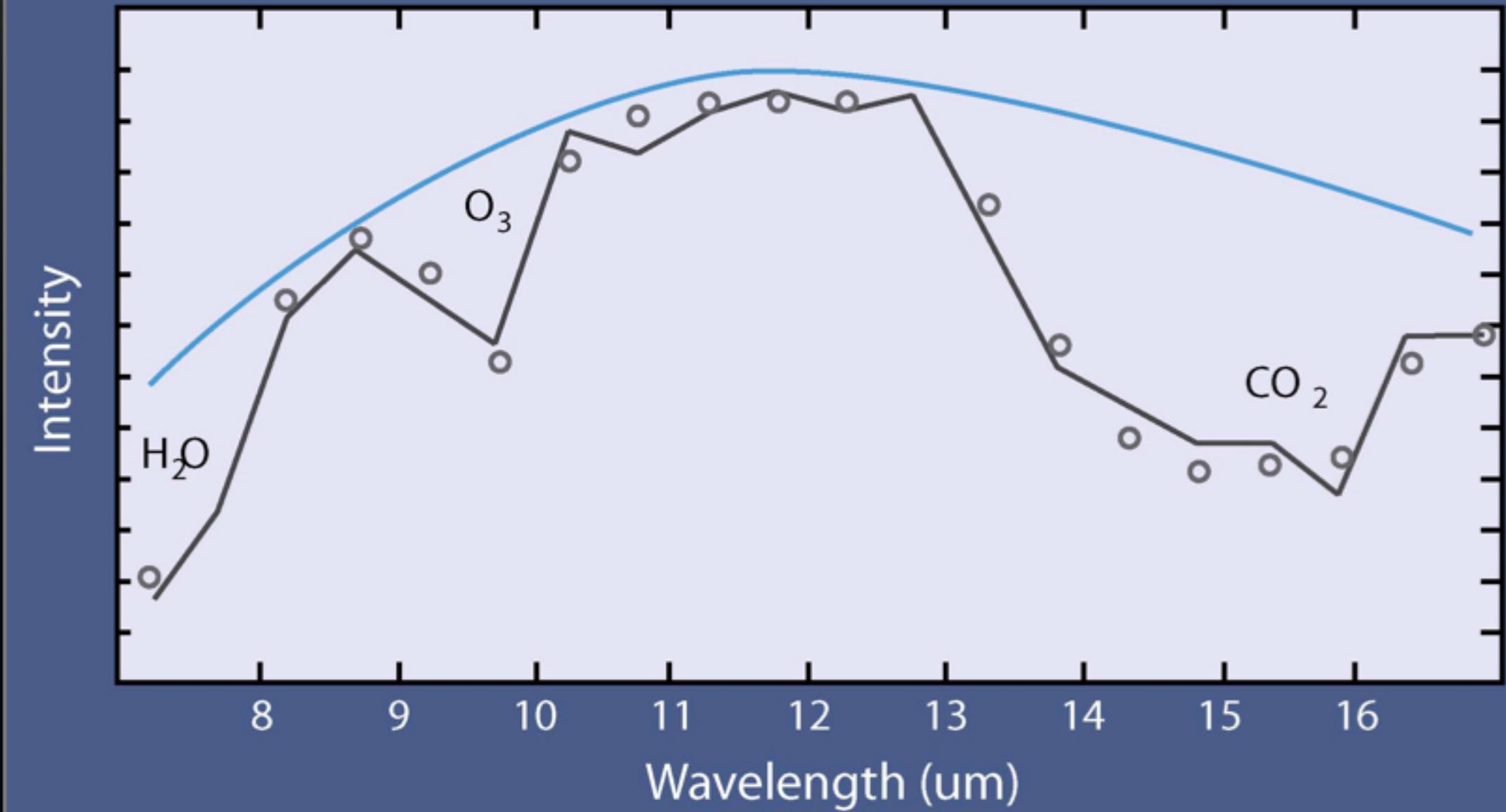
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Simulated Spectrum by Angel and Woolf



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What happened before the Big Bang?

What's at the center of a black hole?

How did we get here?

Are we alone?

What is our cosmic destiny?

What are space and time?



The End
...and the beginning...